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A STUDY OF THE TRANSFERABLE ELEMENTS IN INTERVIEWS WITH PARENTS

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PART I

A COMPARISON OF ATTITUDE SCALES AND THE INTERVIEW METHOD*

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Importance of Determining Transferable Elements

Leaders of parent education groups have to deal with the problem of what they need to know about the practices of individual parents if they are to assist them in learning and using essential child development principles. Furthermore, they are concerned with methods for obtaining this knowledge reliably and efficiently.

The personal interview has been one method frequently used. It seems probable that certain elements or items of the interview would apply equally well to a large group of parents, as there are factors and relationships in many families which are alike. Consequently these portions of the interview could be investigated by similar techniques. Such items, because of the appropriateness and applicability to a large number of parents, are designated in this study as transferable elements.

A knowledge of the transferable items in the interview would not only lessen the time necessary for an interview but would also tend to increase the objectivity of the interviewer's judgments.

This study attempts (1) to determine factors pertinent to the guidance of the parent as a learner which may be secured from a large group of parents as effectively as from one parent, and (2) to devise techniques for securing this information as reliably as possible with a minimum use of the parents' and leader's time.

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Areas of Information Helpful to Leaders

In outlining the appropriate area of information for leaders of parent education groups, the parent is considered as a potential learner. Pertinent knowledge includes an understanding of factors which will make possible intelligent guidance of the parents' learning. These may be divided for convenience into two groups: (1) the general conditions favorable to efficient learning and (2) the knowledge, attitudes, emotional pattern, etc. necessary for the intelligent guidance of children.

Parent as a Potential Learner

A. What does the parent now know, do, and believe? (Present status of knowledge, attitudes, etc. essential in intelligent care and guidance of children)
B. How can learning be stimulated?
   1. General condition favorable to learning
   2. Possibilities of development
   3. Motives for learning

Areas Selected for This Study

From this analysis of the important facts to be known about the parent as a learner, it is desirable to know which ones can be obtained by techniques other than the personal interview. Parents' knowledge of child development and family life can be obtained by techniques whose reliability and validity, at least to a fair extent, are already known. Parents' reading ability and methods of study have also been investigated.

The psychological status of the parent in regard to attitudes, emotional patterns, and fundamental satisfactions has not as yet been investigated to any great extent. Such a study is important because these factors are often the motives underlying parental behavior. Since attitude scales are gaining recognition as effective instruments of investigation, this study proposes to study them as a substitute for a personal interview, or an integral part thereof.

Appraisal of the Interview Technique

In an analysis made of studies which have employed the interview method, investigations were selected which emphasized certain aspects of the interview technique or dealt with various phases of family relationships which are of interest to the leaders of parent education groups. The purpose of this analysis was to discover what areas had been covered by the interview method and the extent to which it had been used effectively in various circumstances.

Areas Covered by Interviews

The interview has been used for widely different purposes, as suggested by the following categories.

1. The most elaborate type is the psychiatric interview which attempts to determine in detail the nature of the emotional patterns of the individual and the motives guiding his behavior. It is especially interested in investigating the subtle nature of factors of behavior and in gaining deeper insight into complex mental mechanisms.

2. The instructional type is highly valuable when it is necessary to check immediately the parent's understanding of a given direction or the application of some principle. An emergency of this kind is illustrated by the case of a nurse instructing a mother in the care of a sick child. It also seems quite probable that the personal interview could be used effectively by a parent education leader to meet the special needs of individual members.

3. The most frequent use of the interview has been to obtain information from or knowledge about the parent, either limited or comprehensive. The interview is the principal means of securing the data for a case study. Murphy and Jensen (12) give in some detail the information which they believe should be obtained for a child guidance clinic. Although such schedules differ with different clinics, this guide is probably representative of the areas usually covered:

I. Identifying Information
II. Behavior for Which Child is Being Studied
  a. Complaints
  b. History of complaints
III. Developmental History of Child
  a. Gestation period and delivery
  b. Medical history from birth to date
  c. Early development
  d. Early habit formation
  e. Early personality development
IV. Child's Present Background and Make-up
  a. Later personality development
  b. School adjustment
  c. Recreational interests
  d. Sexual adjustment and development
  e. Vocational adjustment
V. Family History
  a. Parents' relationship to grandparents
  b. Parents' personal history
VI. History of Siblings of Patient
VII. Parents' Methods of Discipline
VIII. General Background
  a. Neighborhood
  b. Home
IX. Information re Informant
X. Summary

Case studies are of interest to leaders of parent education groups since they are a popular technique for studying the behavior problems of children and various factors in family relationships. The extent and depth of the inquiry will necessarily depend upon the needs of parents and the purpose of the leader, but short cuts in technique would greatly assist in securing information for effective guidance.

Advantages of the Interview Method

One of the outstanding characteristics of the interview is its adaptability to informal situations. Relying largely on conversation, it can be employed in many situations in which investigators would not be able to secure co-operation with a more formal technique. Phillips (13) used the interview in

handling neuroses of college students. The informality of the method is helpful in breaking down the reserve of the subject and in securing his confidence. The natural, spontaneous answers frequently include not only the data desired but the subject's interpretation of these data, which is often useful in diagnosis and treatment of problems.

Moreover, the interview secures detailed replies. Charters (2), in a study of the traits which determine success in certain vocations, outlines the interview used with employers in asking them to list the essential traits for a successful worker in their respective fields. For surveys of this type subjects sometimes give facts more freely in conversation than in writing. Then, too, by adroit questioning the interviewer may be able to keep the subjects' attention on the problem for a longer period of time than the subjects would spend voluntarily. Further questioning may amplify statements which are either too general, vague, or evasive to give a fair indication of the subjects' reaction.

Home interviews offer opportunities for evaluating the subject's environment. Sewall (15) found it profitable to supplement case studies with home visits in her investigation of some causes of jealousy in children. Visits to the homes of jealous and nonjealous children made it possible to study what factors there caused or contributed to the development of jealous feelings in children. Jack (8), in attempting to determine the effectiveness of the training received from a parent education course, interviewed mothers in the home just preceding and following the special training. The interviews were concerned with the behavior of the child and practices of the parent. Parent educators may likewise find home visits profitable in building a basis for interpreting parents' needs. But when the reliability of the interview is not determined, its validity is questionable and, therefore, its usefulness as an instrument of research curtailed.

In a limited field of parent activities, the interview may elicit specific information. Hanson (5) interviewed ninety children to find out to what extent their parents gave them experiences leading to the development of appropriate concepts of the place of money in the social system. The interview appears applicable for a survey of still other areas of parental activities.

The statistical analysis of the data obtained from a large number of case studies may be useful in detecting trends and directions of child behavior and family relationships which are of interest to a leader of a parent education group. Levy (10) studied the case history records of 700 children in which were revealed 1,037 different conduct disorders. He made a quantitative study of the relationship between intelligence and economic status as factors in the etiology of children's behavior problems. He found an increase in personality problems and a decrease in social problems with increased economic levels.

Leaders of parent education groups may find the interview advantageous in helping the parent to analyze his own problem. A joint analysis technique is frequently used in marital relations clinics and by preschool teachers in parent conferences. Hixenbaugh (7) made a study of 101 cases of married couples who sought help from a reconciliation clinic. She reports that an analysis of the specific difficulty in the light of the entire marital situation was often all that was needed to effect a reconciliation between an estranged husband and wife.

Since nervous patterns of associates tend to affect the nervous habits of children, the interview may be useful in evaluating the influence of the parent on children's problems of this type. Although the majority of investigators have not found the interview highly satisfactory for estimating personality traits, Kornhauser (9) noted that discrepancies between ratings of different judges are sometimes due to actual differences in the behavior or attitude of the person rated. It seems probable that some types of personality traits might be revealed through an interview which would furnish a clew as to which approach might be the most effective for a leader to use in guiding that specific parent's learning.

The interview has been found helpful in test construction. Stutsman (16) used it as a means of collecting material for test construction. Data obtained from parents of children judged to be adjusted and from parents of children rated as unadjusted furnished the basis for the construction of a test to differentiate these two groups of parents. With the interview method, Ackerley (1) determined parents' understanding of the terms in a series of knowledge tests relating to child

development and discovered possible misconceptions as to the meaning of the various items.

In evaluating the advantage of the interview as an instrument of research, perhaps the best statement is given by Hartmann (6). "In many investigations it is undoubtedly true that the interview is more valuable as a supplementary device than as a primary instrument, but even where it legitimately occupies this subordinate position it can generally be relied upon to insure a more intimate and personal acquaintance with the raw data. Often in these cases the judiciously guided interview permits a deeper insight into complex mental mechanisms than could be obtained through any other procedure." (p. 207)

Disadvantages of the Interview Method

One of the chief disadvantages of the interview method from a practical point of view is the amount of time it involves. Even when the interview is well organized and the procedure thought out in advance, it requires considerable time to gain the confidence of the interviewee and accomplish the purpose of the interview. As used at the present time, an individual interview usually is given each subject; but one interview may not be sufficient. It may be necessary to conduct a series of interviews such as those frequently used in making a case study. It is apparent, therefore, that the time element involved in the personal interview presents a real problem.

While the interview is useful in pointing out existing problems in child behavior and family relationships, generally it has not been successful in isolating the underlying causes of these problems. Conklin (3) made case studies of 128 high school students who had IQ's of at least 130. About one-half of these students were unadjusted at school. A study of the family backgrounds of the two groups failed to show differences which would account for the differences in the behavior of these children at school. Weille (17) used the same technique, with families which had both problem and adjusted children, in an effort to determine causal factors for this difference, but she was only able to show factors which made differences in the environment of children in the same family.

The results of such studies seem to indicate that regardless of the time and labor required in case studies, they usually fail to isolate the components of behavior so that they may be measured satisfactorily. They indicate the existence of accompanying factors or conditions without indicating causal relationships. It seems probable that behavior problems are overt manifestations of various physical and psychological factors and require a measuring device which will determine the existence of cause and effect relationships.

Another drawback to a wide use of the interview method is the high degree of skill which is required in successful interviewing. Because the interview is an accessible method of investigation and because it can be adapted to such widely different purposes, it might appear to be a method which could be highly recommended for the use of untrained workers. But actually the interview is not easy to control because it involves the intricate mental processes of another person and these processes are not always tractable. Errors arise from three sources, the interviewer, the interviewee, and the relationship between them. Although the technique appears simple, it requires skill in its application and interpretation.

The interviewer may contribute to the unreliability of the interview by not being adequately prepared. Unpreparedness may include a lack of understanding of the problem and the contribution that he wishes to secure from the interview. It may be the failure to word his questions properly or to ask them in the right sequence. It may be the failure to secure co-operation of the subject or to interpret properly the subject's response. Without conscious guidance there may be a contagious bias of the interviewer's interpretation of the response of the interviewee. Rice (14) describes an inquiry in which twelve investigators interviewed homeless applicants for lodging. The records revealed a transfer of each investigator's bias to the applicants and a corresponding distortion in the replies which the applicants gave. The replies secured by interviewers opposed to the use of liquor attributed the condition of the applicants largely to this factor, whereas those interviewers who were unopposed to the use of liquor did not find it a principal cause in the men's destitute condition.

The interviewee may contribute to the unreliability of the interview by not giving a fair response. He may not understand what is wanted, he may not be able to express him-

self, or he may not wish to reveal the desired information. Moreover, if the relationship between the interviewer and interviewee is antagonistic rather than co-operative, the interviewee may be deliberately deceptive in his responses. In actual practice, however, errors arising from the interviewee are not as frequent as those from the faulty techniques of the interviewer.

Techniques to Improve the Interview

Written aids have proved helpful in eliminating some of the possible errors that occur in oral interviews. Ambiguities in the statements on blanks may be discovered and corrected more easily than in oral statements. It is also possible to check the wording on a blank to be sure that it is clear.

A schedule of questions has been found useful in keeping the interview in hand and insuring that no vital considerations are overlooked. Hamilton (4), in his investigation of marital relations, provided an additional safeguard to his schedule questions. In conducting the interviews, he presented a series of questions, each printed on a card, and recorded the responses which subjects voluntarily offered. This technique was adopted to minimize the influence of the investigator on the subjects' responses. He tried to avoid furnishing clews to the answer expected or to his own opinion by controlling his facial expression and tone of voice.

In general there has been little progress made in improving the reliability of the interview. It has been the practice of investigators to assume that their interviews are reliable without making an effort to check their reliability. Such neglect may arise either from a lack of interest in improving the interview technique or from a failure to devise instruments which are appropriate for this purpose. The problem of making the interview as reliable a device as possible for securing dependable, valid data is a fertile field for investigation.

Conclusions

It appears from this analysis that the interview may be used by the parent educator for three different purposes: (1) to obtain information from the parent, (2) to give the parent knowledge, or (3) to motivate the parent's learning. In specific cases the possibilities and limitations of the interview method should be appraised from the viewpoint of its intended function, but analysis reveals certain general conclusions in regard to its usefulness for leaders of parent education groups.

The interview appears to have the following advantages:

1. The interview offers opportunity for joint analysis of family problems by the parent and leader.
2. Home interviews offer opportunity for an evaluation of the parent's environment.
3. The interview furnishes opportunity to study the behavior and nervous patterns of the parent.
4. Pertinent material for test construction in a selected field of parental activities may be obtained by the interview.
5. In a survey the interview may be useful in discovering general characteristics of a specific field of parental activities.
6. The interview furnishes opportunity for parental emotional expression which may act as a "safety valve."
7. It is a useful method for effecting some desired emotional readjustment in the parent.
8. In comparison with written techniques, the oral interview furnishes opportunity for: (1) the clearing up of misconceptions in meaning, (2) supplementary questions to investigate generalities and obscure points or evasions, (3) more detailed replies, and (4) natural, spontaneous answers.

Errors may easily occur in the interview through faulty techniques such as the following:

1. The interviewer may be prejudiced in his report by his own opinion.
2. The interviewer may not be able to report the interview accurately.
3. The interviewee may not wish to reveal the desired information.
4. The interviewer may suggest the answers to the person interviewed.
5. The feeling between the interviewer and interviewee may be antagonistic.
6. The interviewee may not understand what is wanted or may not have the ability to put into words the information sought.

Substitution of Attitude Scales for Interviews

This portion of the study was undertaken to determine how successfully an attitude scale may be substituted for the interview in securing parents' attitudes regarding child development and family relationships. The aims are as follows: (1) to find the reliability of two interviewers' interpretations of parents' attitudes, a need which was emphasized in the investigation of the results obtained by studies using the interview technique; (2) to compare the results obtained by the interview with the data obtained through the use of attitude scales.

Procedure

The method employed by Ackerley (1) was extended to include the interviewers' interpretations of parents' attitudes and an objective description of this attitude by allocating the parent's opinion on a previously constructed attitude scale. The reliability of the method was computed by determining the differences between the allocations of a given parent's opinion by two interviewers on a selected attitude scale. The comparison of the interview with the attitude scale was made by obtaining the difference in a parent's attitude score and the placement assigned to him by the interviewer.

Scales Employed.—Three attitude scales were used in this study, all constructed by psychophysical techniques or some modification of them. A description of these is given in a former study by Ackerley (1). The reliabilities of these scales had been previously determined. The statements of the Ackerley scale on the desirability of giving children between the ages of six and twelve sex information have an average Q-value of 1.3. The statements in the Butler (12) scale on the attitude toward the father's participation in the care and upbringing of children have an average Q-value of 1.25. The self-reliance items were taken from the Ojemann scale on the attitude toward self-reliance in preschool children which has a reliability of .91 when the Spearman–Brown prophecy formula is applied to the correlation obtained from the scores on odd and even items of the test.

Subjects.—The subjects used in studying the effectiveness of attitude scales as a substitute for the personal interview were mothers of children of preschool and elementary school age. An attempt was made to secure parents who represented a wide range in education, cultural background, and experience. The education of the majority of parents used in this series of interviews extended beyond the eighth grade.

Interviewers.—The interviews were conducted by the writer and an assistant who was a worker in parent education and had had several years of experience in interviewing parents. She was familiar with the use of attitude scales and had made a special study of the scales used in this investigation.

Interview.—Several factors in the method of conducting the interview were considered important for insuring reliable responses. First, the interviews were not of a compulsory nature. The mothers voluntarily agreed to give their assistance. In this way, disinterested subjects were avoided and a certain degree of co-operation insured. Next, the interviews were informal in nature and designed to put the subject at ease. To promote this feeling of ease on the part of the interviewee, the interviews were conducted in the homes of the subjects. The time selected for the interview was one when the mother would be relatively free for an hour or more because continued distractions were regarded as highly unsatisfactory for a reliable interview. If callers came, or the subject was disturbed repeatedly, the interview was terminated and no evaluation made of the parent's attitude.

In conducting the individual interview, effort was made to establish friendly rapport and to have the subject feel that she could contribute something valuable. After the interviewer and interviewee were at ease, the topic related to one of the attitude scales was introduced by a general question. The questions were designed to stimulate the parent's conversation regarding his opinion and practices pertaining to the questions involved in the scale selected for comparison with the interview. Illustrations of these questions are, "What is the effect on family relations if the father confines his interest in his children largely to providing for their financial support?" "At what age should a child assume responsibility for the care of his various physical needs?" If such questions appeared to be too academic for the subject, the same ideas were expressed within the range of the subject's familiar vocabulary.

The interviewer was careful to avoid anything in her attitude which might be construed as criticism of the opinion expressed by the subject. It was considered desirable to keep the subject talking, permitting her to give a full free account of her opinions. This method, of course, introduced some irrelevant material but it was felt that statements made spontaneously were more apt to reveal the attitude of the subject than those obtained by direct questioning. When it was necessary to ask supplementary questions to encourage the subject to amplify some statement or to secure information necessary for a clearer description of the parent's attitude, the questions were worded as expressions of interest in what the subject was saying. Another important precaution observed in the interview was to determine if the subject was ambiguous in her attitude. For this purpose it was necessary for the interviewer to direct the conversation so that it covered the attitudes expressed in the entire length of the scales investigated.

Reliability of Interviews

The differences were computed between the two interviewers' allocation of the opinion of seventeen parents on the questions involved in the attitude scales presented in the interview and expressed in terms of the scale values. The following tabulation shows the differences obtained for each of the subjects on each scale.

	Scale		
Subject	I	II	III
1	.2	.0	.2
2	.1	.8	3.2
3	1.6	.7	.6
4	.3	1.1	.3
5	.2	.8	.1
6	1.6	.8	.6
7	.8	.7	.6
8	.1	1.3	.7
9	1.9	.7	.6
10	.7	.6	.3
11	.1	.4	.6
12	.8	.9	.1
13	.1	.8	.6
14	.2	.6	.3
15	.6	.6	.4
16	.2	.7	.4
17	.6	.6	.6
Mean	.6	.7	.6

The range of the differences of the interviewers' placement of the subjects on Scale I, the desirability of giving children sex information, was .1 to 1.9; for Scale II, the attitude toward self-reliance in preschool children, it was .0 to 1.3; for Scale III, regarding the participation of fathers in the care and upbringing of children, it was .1 to 3.2 steps.

The mean differences in the allocation of the subjects on Scales I and III as shown in the preceding tabulation are .6 of a scale value. These mean differences are less than one-half of the mean Q-value of the statements in either scale, so that the placements are well within the reliabilities of the scales. The mean disagreement of the two interviewers in placing parents in their attitude on Scale II was .7 of a step value. The reliability of this scale is about one step. It appears, therefore, that these interviews are reliable.

Comparison of Interview and Attitude Scales

The comparison of the results obtained by the interview and those obtained by attitude scales is measured by the mean difference between the interviewer's allocation of the subject and the subject's score. The differences in the scores are expressed in step-values. Analysis of the data based on forty parental interviews involving the three attitude scales is shown in the following tabulation:

	Scale		
Subject	I	II	III
1	2.0	.8	4.6
2	.2	1.3	.2
3	1.4	1.9	.9
4	.1	1.9	.3
5	1.1	.8	.0
6	.4	1.7	.5
7	1.1	2.8	4.3
8	1.3	.3	4.4
9	.5	.9	.9
10	.7	.1	1.4
11	.6	.6	.9
12	.4	.8	.3
13	.8	1.3	.9
14	.0	.9	.7
15	.0	1.2	.4
16	.6	.8	.2
17	.0	.7	.9
18	.6	.4	.2
19	.3	.5	.6
20	.4	.2	.6
21	.3	.1	.1
22	1.0	1.5	.0
23	.8	1.2	.4
24	.6	.8	.2
25	1.8	2.1	3.2
26	.3	1.2	.9
27	.2	.8	.3
28	.3	.0	.1
29	.9	.9	.6
30	2.0	2.1	.6
31	1.9	1.0	.7
32	.2	.9	.9

Subject	Scale I	Scale II	Scale III
33	.4	.5	.3
34	.0	.2	.9
35	.9	.3	.1
36	.2	2.1	.9
37	.6	1.0	.3
38	.8	.2	.0
39	.6	.8	.4
40	.6	.3	.4
Mean	.6	.9	.9

The range and the interquartile range of the differences between the interviewers' and subject's scores on Scale I, the desirability of giving children sex information, was .0 to 2.0 steps and .3 to .9, respectively. The range on Scale II, self-reliance, was .1 and 2.8 steps with 50 per cent of the differences falling between .5 and 1.2 steps. For Scale III, fathers' participation in the care and upbringing of children, the differences extended from .0 to 4.6 steps with an interquartile range of .3 to .9.

The mean differences as indicated by the preceding tabulation were .6 for Scale I; .9 for Scales II and III. Attitude scales can then be substituted for the interview without much greater error than that which occurs with specially trained interviewers.

While the mean differences of the results of the interview and of the attitude scales are well within the reliability of the scales, they are slightly greater than the relationship of one interviewer's placements to the placements of the other. It may be interesting to observe some factors which might account for this increase in the mean disagreement.

1. The interviewer or parent may have difficulty in a separation of attitude and practice. For example, a mother felt that children between the ages of four and six years should be able to dress themselves, but since her own children of that age were not interested in dressing themselves, she helped them rather than have them fuss about it.

2. There may be a confused rather than a clear-cut attitude on the part of the subject. It appears that parents recognize some of the statements of the scales as familiar experience and confuse them with their own attitude. One mother after marking the scale on sex information commented in this manner, "A lot of girls have told me that they might have been saved from much unhappiness if their mother had given them sex information while they were growing up." Yet this particular mother had made no effort to give her twelve-year-old daughter sex information and felt that the child had displayed no curiosity over the arrival of a new baby in the family two months earlier. In regard to her own children, this mother said that she felt that if she took them to Sunday School regularly and taught them good moral principles sex information was unnecessary.

3. The parent accepting an attitude as an ideal but denying its practical application was another factor contributing to disagreements in scores. This is illustrated by the mother who felt that a father's participation in the care and upbringing of children was conducive to the establishment of good relationships within the family, but that her husband was too tired when he came home to give the children care or attention.

4. It appears that further investigation is needed to measure the ambiguity of the parents' attitudes. The interviewers found difficulty in detecting and expressing ambiguous attitudes in relation to different items in a scale. In the self-reliance scale it was not uncommon to find the attitude favorable in situations which freed the mother from work and which involved small elements of risk, such as those relating to self-feeding and dressing, and unfavorable in situations which involved some risk, such as the child's going away from home unattended or the child's freedom in the expenditure of money. A score of 4.0 may represent a composite of widely different opinions and a further analysis would be helpful in adequately describing parents' attitudes.

Conclusions

The use of carefully constructed attitude scales appears highly feasible for obtaining parents' attitudes. Since the reliability of the interview was established, it appears that the results obtained by the scales used in this study agree sufficiently with those obtained by the personal interview to make them useful in a diagnosis of parents' needs. The data obtained are of an objective nature and can be handled statistically. This eliminated many problems and errors arising in the treatment of data which from their very nature must be treated subjectively and are colored by personal interpretations. Attitude scales are economical of time in that they may be filled out in groups or at the parent's con-

venience. The scales furnish an objective record of the parents' attitudes so that comparisons may be made from time to time with the same parent.

Summary, Conclusions, and Recommendations

The purpose of this study has been (1) to determine factors pertinent to the guidance of a parent as a learner which parent educators may secure from a large group of parents as effectively as from one parent and (2) to devise techniques for securing this information as reliably as possible with a minimum use of the parents' and leader's time.

Since leaders of parent education groups at present rely largely on the personal interview for obtaining this knowledge, an appraisal was made of studies employing the interview technique to ascertain its possibilities and limitations for such purposes as the counseling and guidance of parents. The results of this survey lead to the following conclusion: as a secondary instrument of research the interview is valuable for obtaining a high degree of familiarity with data, but as a primary instrument of research it is very time-consuming and its reliability has not been given sufficient attention to insure valid data through its use.

The possibility of substituting carefully constructed attitude scales for portions of the personal interview was investigated. Three scales were used: the Ackerley scale on the desirability of giving children sex information between the ages of six and twelve; Butler's scale on the attitude toward fathers' participation in the care and upbringing of children; and the Ojemann scale on the attitude toward self-reliance in preschool children. The scales, all constructed by psychophysical techniques or modifications of them, have reliabilities which appear satisfactory.

Two trained interviewers conducted interviews with seventeen parents. The interview was given at the home of the subject and conducted in an informal manner. The questions used were designed to stimulate the conversation regarding the attitudes involved in these scales and the interviewers marked them independently. The mean differences of the interviewers' placement of the subjects (1) according to their attitude toward the desirability of giving children sex information and (2) according to their attitude toward a father's participation in care and upbringing of children was .6 of a step-value. These differences are less than one-half of the mean Q-value of these scales. The disagreement of the two interviewers in placing parents according to their attitude toward self-reliance was .7 of a step-value. The reliability of this scale is .91. It appears, therefore, that these interviews are reliable.

A comparison of the results of the interview and the data obtained through the use of attitude scales was measured by the mean difference between the interviewers' placement of the subject and subject's score obtained in the usual way of administering the test. These differences are expressed in step-values. Analysis based on forty interviews shows the following mean differences: for scale on sex information .6; for self-reliance .9; for fathers' participation in the family .9. From these data it appears that attitude scales can be substituted for the personal interview without much greater error than that which arises with specially trained interviewers.

This investigation seems to show that with the use of carefully devised instruments certain portions of the interview are transferable from interview to interview and from interviewer to interviewer, and that accuracy of results is not sacrificed through the use of the shorter method of investigation.

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PART II

PARENTS' PRACTICES AND APPRAISAL OF CHILD'S GROWTH

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The purpose of this part of the study is to determine whether a record form, consisting of duplicate and somewhat disguised questions which are checked by the parent, can be used as a substitute for the interview in obtaining a description of parental practices and the parents' appraisal of the child's growth. The areas selected for study include: (1) methods and provisions of the parent for guiding the child in learning, (2) descriptions of the behavior and development of the child, and (3) parent's appraisal of the child's growth.

Subjects

It became clear early in the study that lack of agreement between two forms of a question often arises from language difficulties. Such difficulties were found to be of two types: failure to comprehend the item and differences in interpretation. Both forms of each question were, therefore, first submitted to a group of twelve subjects varying in economic and educational status. On the basis of the results, the items were revised. This first group of subjects will be referred to throughout the study as the preliminary group.

The revised forms were then used with two groups of fifteen subjects, one group highly favored in educational and economic back-

grounds (Group I) and the other less favored in these respects (Group II). The following tabulation gives the educational background of each group:

Formal Education	Group I	Group II
Fifth grade		1
Sixth grade		1
Seventh grade		1
Eighth grade		7
One year high school		2
Two years high school		1
Four years high school	1	2
One year college	1	
Three years college	3	
Four years college	5	
Graduate work	5	
Total	15	15

The ideal procedure for obtaining the data seemed to be to have a random third of the subjects in each group fill out Form A first, to have another third fill out Form B first, and to have the interview held first with the remaining subjects. For six of the subjects in Group II the interview was given first, in five cases record A, and in four cases record B. In Group I it was found desirable, in order to secure the types of co-operation desired, to give the interview first in all but two cases.

The various sets of data were gathered approximately a week apart. Two of the three days were allowed for filling in the blanks. Subjects were selected who had had some contact with the work of the Station through study groups, clinics, and the like.

In the first meeting, a home call, it was explained that the investigator desired to find out what preschool children were able to do for themselves and parents' methods in the home environment. It was also indicated that some of the data were to be obtained by two written records and some orally. No mention was made of the duplication of the items. In a few cases the subjects stated, when the third set of data was gathered, that there seemed to be some duplication. It was explained that to obtain a complete picture it was desirable to approach some of the areas in several different ways.

Construction of Record Forms

Method of Duplicating and Disguising Items.—Three general methods of duplicating will be described. One method consisted of asking for the data on one form directly and on the other indirectly through items from which the answer to the major question can be derived. An example of this is furnished by the item relating to the methods the parent uses to help the child learn the meaning of property rights: On one form the item appeared as follows:

Is your child learning the difference between his property and that of other people as quickly as you think a child of his age should?_____

If your answer is *no,* check any of the following which you use so that he will learn more quickly the difference between his and other people's property. If your answer is *yes,* check those you use to help him keep on learning.

a. Try to supply his needs and satisfy his desires. For example, if you find him coming home with small cars belonging to another child, buy him some trucks or cars, etc._____
b. Do nothing_____
c. Threaten punishment by law_____

On the other form examples of the following type appeared:

Suppose you found that your child was often coming home with modeling clay belonging to a neighbor child. Suppose your child had no clay. What would you do?

a. Make the child take the clay back _____
b. Tell him he is a bad child_____
c. Take the clay back to the child yourself _____

The responses to the examples on Form B were combined and compared with the responses on Form A.

Another general method of duplication consisted of presenting on one form a list of suggestions for carrying out a general practice and asking the subject to check which of these he uses. The duplicate form consisted of a series of true-false statements interspersed between similar statements relating to other practices and approaching the question from a slightly different angle. The following example will illustrate this general method.

Check any of the following things which you have and regularly use in your home to help your child learn to feed and care for himself at mealtime.

a. Small knife, fork, and spoon
b. A low table and a low chair
c. Apron or bib which child can put on himself

d. A table covering which is easily cared for such as oilcloth, washable finish, etc.
h. If you use something not given here, what is it?

On the other record each item appeared in the form of true-false statements distributed among similar statements relating to other practices.

In addition to making it appear that the data are gathered for another problem, this method makes it possible to separate statements relating to a given practice and distribute them throughout a fairly long list so that it becomes difficult for a subject to duplicate his responses through sheer recall.

A third method of duplication consists of providing suggested lists on both forms but presenting them so that the purposes seem to be different. This method is illustrated by the items relating to dressing and undressing. In one form, only items which are in the main helpful were listed and the subject was asked to check which he used. At the end of the list he was given an opportunity to add any other items, not included in the list, which he was using. In the other form a list of items, some hindrances and some helps, was given and the subject asked to check the list in two ways: first, things which will help my child to dress and undress; and second, things I have used or am using in order to teach my child to dress and undress. One list is much longer than the other since it contains hindrances as well as helps.

Methods of Overcoming Comprehension and Interpretation Difficulties

Early in the study it became apparent that difficulties in language were responsible for many disagreements between duplicate items or between the written forms and the interview. The difficulties arose from lack of comprehension and variations in interpretation. Since this point is relatively important, typical examples will be discussed to illustrate how difficulties were overcome.

In the question relating to provisions for self-help at mealtime such an item as "Do you use an apron or bib?" was interpreted by some of the subjects to mean just the act of using but not the tying or fastening by the child himself if such is necessary. The wording was, therefore, changed to "apron or bib which child can put on himself." Numerous instances of such differences in interpretation were encountered.

Inclusive statements which are almost always partly true and partly false were found to be unsatisfactory. In the items relating to dressing and undressing, for example, it was found more helpful to use specific garments in questions relating to such items as method of fastening, ability of child to put on and take off, and ability to button or lace. For the general items, such as "Whenever possible I use clothes which fasten in the front," specific articles of clothing were substituted.

Such general and indefinite adjectives as large, small, few, and many were wholly inadequate. In order to specify the meaning intended more precisely, various devices were used. In items relating to the size of buttons, for example, size was illustrated by a diagram.

To assist subjects in the lower group in following directions, many devices were employed for making the directions clear. In all cases length was cut to a minimum. Vocabulary was thoroughly simplified. In one item the subject was asked to check the list twice for different purposes. In such cases one set of blanks was placed on the left-hand side and one set on the right-hand side. Different types of lines were used to emphasize the distinction. Placing the blanks on either side of the item overcomes the difficulty of following across the page through two or more columns.

Classification of Responses

In comparing the data obtained on the two forms and in the interview, the responses were classified in the two categories *agreement* or *disagreement*. For the vast majority of items the precise meaning of *agreement* and *disagreement* is reasonably clear. For some items, however, it was necessary to develop a few guiding principles.

In the items relating to the devices which the parent employs to help the child learn to dress and undress himself, responses such as "some," "about half," and "mostly" were among the possible answers. Such responses were considered equal in meaning to an affirmative response on the corresponding true-false item. In the discussion of the construction of the record forms it was indicated that sometimes a direct statement was used on one form and several concrete situations

from which the answer is to be derived in the other. Responses on the concrete situation must in the majority of cases (usually two out of two or three) correspond to the response to the general statement in order to be considered as agreement.

Some of the items required responses in terms of specific ages, amounts of times, or times of day. In such cases arbitrary limits were set to simplify the tabulation. In the item relating to the number of hours of sleep which the child receives, for example, responses were considered as agreeing if the amount given in the two forms checks within one hour.

In some of the questions relating to the parent's appraisal of the child's progress, cases were encountered in which the parent responded to such questions as "I think my child is learning to dress and undress himself as quickly as he should" with the statement "He is too little to dress and undress himself." Such a response was classified as an affirmative response since there is no indication that the child is doing less than the parent expects of him.

Method of Conducting Interview

An appointment for the interview was not made until rapport had been established between the interviewer and the interviewee. In most cases the subjects had already cooperated in other projects or had had some contact with the Station.

The specific order of the interview depended upon the general situation. Questions of a definitely factual type relating to relatively simple and observable phases of the environment were discussed first and the others followed. An effort was made to establish and maintain an informal attitude throughout the interview. Checks or brief notes were made on a guide which contained the major questions.

In obtaining answers to such questions as the child's ability to dress and undress himself, self-help at meals, and the like, the general procedure consisted of asking a relatively large number of questions relating to specific items. Instead of asking for a blanket statement as to the child's ability to dress himself, for example, specific questions were used, such as "Can he put on his shoes?" "Can he lace his shoes?" "Can he make the bow in his shoestrings?" and "Can he put on his mittens?"

In obtaining appraisal of the child's growth, the parent's attitude toward the growth of numerous individual items was considered. When such a question as "Can he lace his shoes?" was under consideration, some question followed, such as "Do you think he is doing this as well as he should?" Or some comment was made, as "Sometimes children are slow in developing this ability, sometimes rapid: how would you classify your child?" From numerous items the investigator generalized as to the parent's appraisal of the progress the child was making.

Special care was taken to obtain adequate information relative to the child's social and emotional development and the methods used by the parent to further this development. The objective was to obtain an answer to a major question. The approach, however, was somewhat indirect. Situations in which the behavior in question might occur were brought to the focus of attention. Then several questions relative to each were asked and from the individual answers a summary answer derived. In obtaining data relative to the child's aggressive-submissive tendencies, for example, the question was approached as follows: "Does your child have playmates near his age?" "Does he play with them a good deal?" "Do you think he plays with them the way he should?" "Do the other children like him?" "Do they give in to him?" "What effect does the way he is playing with the children have on him?"

The general outline of the interview is given below. In all cases an attempt was made to obtain answers to the questions listed.

I. Self-Reliance in Dressing and Undressing (Progress of Child, Provisions Parent Has Made or Is Making for Growth, and Parent's Appraisal)

   A. Does the child undress himself? Under this heading questions relative to each of the following were asked:

      1. When the child goes to bed or lies down, who takes his clothes off? (pursued until a description of the child's part is given)
      2. Sometimes children are slow in learning this skill, sometimes rapid.

3. How would you classify your child?
4. Do you think he is learning as rapidly as he should or would you like to have him learn faster? (This general question was approached in several different ways, as indicated in the discussion above.)
5. The list of items is as follows:

   shoes (taking off)
   shoes (unlacing)
   underwear, suit, or dress
   stockings
   cap
   mittens
   coat or play suit
   nightgown or pajamas
   overshoes or rubbers

B. Can the child dress himself? For each of the items given under A, answers to two questions were sought: When the child gets up in the morning or when he goes out to play, who usually puts_____on? (pursued until child's part has been described) Would you say that he is learning as rapidly as he should, or more or less rapidly? (approached in several different ways, as indicated above)

C. Provisions parent has made or is making for child's learning dressing and undressing. This general area was approached indirectly through the following questions:
   1. Where do most of your child's clothes fasten?
   2. Do you use any elastic in his clothes? If so, in what clothes?
   3. What else do you use to fasten his clothes?
   4. Do you have any clothes which can be put on without fastening? If so, what are they?
   5. How big are the buttons?
   6. Where do you keep his clothes?

II. Progress in Self-Help in Washing and Provisions for Growth
   A. When your child comes in from play with dirty hands and face, who usually washes his hands? his face?
   B. Who usually washes his hands and face before going to bed? before mealtime?
   C. Where do you keep the washcloth and towel which he uses?
   D. Where does he get the water with which to wash?
   E. What changes have you noticed in the rate in which he is learning to wash himself?
   F. What do you think about his rate of growth in this respect?

III. Self-Help in Eating Situation, Progress, Provisions for Growth, and Parent's Appraisal
   A. Where does the child usually eat his meals?
   B. What does he sit on? Is this usually the case?
   C. Who is usually present when the child eats his meals?
   D. How much help does this person have to give the child? (pursued in some detail if necessary to obtain a description of the child's part)
   E. Do you think the amount of help you are giving him is good for him, or do you think he should learn faster?
   F. Does he wear a bib? an apron? Who puts it on? May I see the silverware he usually uses? the dishes?
   G. What do you use for a tablecloth where the child eats?
   H. Does he usually enjoy his meals?
   I. Does he like to come to meals?
   J. How often do you have to urge him to eat?
   K. How often does he play with his food?
   L. How does the child like to have someone feed him?
   M. How close is this to what you would expect from a child at this age?

IV. Sleep Routine

A. Think of the past two or three weeks. About what time does your child usually go to bed?

1. About how often during this time did he go to bed between ____ and ____? (considered in succession the following ranges to check the time of going to bed as well as regularity) one-half hour previous to the time given, one-half hour following the time given, one hour previous, one hour following

B. Similar questions for time of arising.

C. In the past three or four weeks how often did your child go to bed during the day?

1. Did he sleep?

2. How long did he usually stay in bed? (pursued until a fairly definite picture of amount and regularity of time is obtained)

V. Emotional Control (Control of Fear)

A. The child's present fears of and parent's procedure for each of the following:

1. Your child knows what ____ is?

2. How does he usually act when he sees or gets near to (hears or goes to) ____?

3. When he has a chance, does he usually avoid or play with ____?

4. Describe briefly the last time the child saw ____?

5. What did he do? (pursued until a fairly clear description of the child's reaction in several different but ordinary situations and parent's procedures in such situations had been given)

The list of objects or situations follows:

cats
dogs
doctors
thunder
lightning
strangers
fur
wind
fire
deep water
loud noises

B. Provision made by parent for learning control of fears. It was described to obtain answers to the following general questions:

1. For the child's present fears what different procedures is the parent using to help the child overcome them?

2. To prevent the development of fears, do the adults observe such precautions as overcoming their own fears, avoiding indiscriminate discussion in the presence of the child, and helping the child to adjust to new and difficult situations?

Data for 1 were obtained in A immediately above. For 2 an indirect approach was used:

When you were a child, were you afraid of dogs, cats, etc.?

What happened to that fear as you grew older?

Have you told your child about these fears?

Does ____ bother you, or as in the case of dogs, etc., what kinds of dogs do you like?

(Each of these was pursued until one or more tendencies to fear had been disclosed and an indication obtained as to how the parent treats his own fears.)

VI. Emotional Control (Control of Anger)

This was approached by having the parent recall several of the child's recent temper tantrums and by asking how frequently the tantrums occurred and whether in the parent's opinion the child was justified in losing his temper in each situation. From several examples answers were derived as to frequency of temper tantrums and parent's appraisal of growth, that is, does the child lose his temper more often, less often, or about as much as the parent thinks he should.

VII. Distinguishing Own and Others' Property (Child's Progress, Provisions for Growth, and Parent's Appraisal of Growth)

A. Does your child have some place to keep his playthings? If so, may I see it?
B. How is he about keeping his things in (whatever has been designated as the place for playthings) when he is not playing with them?
C. What has your child recently used that belongs to you rather than to him?
D. How did he get the article?
E. What did you do?
F. Is this what he does most of the time?
G. What has your child recently used that belongs to his father rather than to him?
H. How did he get this?
I. What did his father do?
J. Is this what you do most of the time?

If there were any brothers or sisters, similar questions were asked relative to articles belonging to them.

On one of your recent visits when you took the child along, what did the child play with while he was there? (Something was selected which did not belong to the child and an inquiry made as to how he got this and what the parent did.)

Do you think he knows the difference between things that are his own and things which belong to someone else?

Do you think he is learning the difference between his things and other people's as quickly as he should?

IX. Distinguishing Truth and Untruth

A. Practically all children tell things at times which are not true. Name two or three of the things your child told recently that were not true.
B. When he told you untruths what did you tell him?
C. How did you feel when he told you this? (If parent did not clearly indicate whether or not she was surprised or angered, these were asked in a direct question.)
D. Have you noticed any changes in the number of things your child tells you that are not true?
E. What do you think about these changes?
F. What would you like to see in your child as far as truth telling is concerned at the present time?

X. Ascendant-Submissive Behavior

A. Does your child have playmates?
B. What are their ages?
C. Does he play with them a great deal?
D. Do you think he plays with them the way he should?
E. Do the other children like him?
F. Do they give in to him?
G. Who usually does the bossing?
H. What do you think about this?
I. Do you think the present situation is having a desirable or undesirable effect on your child's growth in learning to deal with other children?

Agreement Between Forms A and B

Grouping of Items

Instead of treating the items in the order in which they appear on the record forms, they will be grouped according to their general nature into three classes: definitely factual items, medium factual items, and items

involving a general appraisal. Definitely factual questions include all questions which require for their answers rather definite factual information such as, "Do you use a small knife, fork, or spoon? Do you use a low table and chair?" Medium factual questions are those that are answered by "usually," "about half the time," and "seldom." The last group includes those items requiring the parent to give a general appraisal in terms of some standard which he holds. This classification is an approximate one and is made from the point of view of the questions. This may not coincide with the way in which each subject considered the items. It is based mainly upon the external form. The classification was made for convenience in treatment and for uncovering any differences that may exist in the responses to the various general types.

Definitely Factual Questions

The general nature of the items comprising this group and the per cent agreement on in-

"DEFINITELY FACTUAL" ITEMS

Question	Per Cent Agreement Group I	Group II	Total Group
Provisions for Helping the Child Feed Himself			
Small knife, fork, and spoons	93	100	
A low table and a low chair	100	100	
Apron or a bib which the child can put on himself	93	87	
A table covering which is easily cleaned	93	93	
High chair with short legs, youth's chair, or junior chair	100	100	
Dishes which are not easily broken	100	100	
Mean	96.5	96.7	96.6
Provisions for Helping Child Dress and Undress Himself			
Large buttons ½ inch (give diagram) and larger	100	93	
Zipper fastenings	100	93	
Rubbers in bloomers and underwear	100	100	
Clothes which fasten in the back	100	93	
Slip on garments which need no fastening	100	100	
Clothes which button in the front	100	93	
Shoe strings with tips; unbroken shoe strings	100	93	
Mean	100	95	97.5
Description of Child's Fears			
Dogs	100	93	
Fire	93	67	
Strangers	100	100	
Thunder	93	100	
Cats	100	100	
Dark	100	100	
Doctors	100	100	
Fur	100	100	
Deep water	93	73	
Wind	100	93	
Loud noises	87	100	
Lightning	100	100	
Falling from anything which is some higher than ground or floor	100	87	
Mean	97.4	93.3	95.3
Procedures for Preventing Fears			
Do not talk about fears of adult members of the family	93	87	
Adult members of the family try to overcome fears	93	80	
If there are situations which may cause fear, child is told about them before	100	80	
Adult members of the family try to control and conceal their fears	80	80	
Mean	91.5	81.8	86.6
Provisions for Developing Self-Reliance in Washing			
Low wash bowl	100	93	
Ladder, stool, steps, or a block in front of wash bowl	87	87	
Wash basin and a pitcher of water on a low table	93	80	
Child uses ordinary chair to reach wash bowl	100	87	
No special things available	100	*	
Mean	95.5	88.0	92.0
Mean of all "definitely factual questions"	96.8	92.1	94.5

*Not used by anyone

dividual items between Form A and Form B for Group I, Group II, and the total group are given on page 153. In interpreting the data in this tabulation and in subsequent tabulations, it must be remembered that many of the items on one form or the other appear as questions having in general only two possible answers. By mere chance one would expect a 50 per cent agreement on such items. An analysis of these data will show that the agreement on most of the items is relatively high. The means for the total group are in the neighborhood of 95 except for one item, provisions for preventing the development of fears, for which the mean per cent agreement is approximately 87. This item relates to the methods used by parents to prevent the development of fears. On one form the parent was asked to check several methods. On the other form various situations were presented and the parent was asked to indicate his general procedure. Such items tend to be more abstract in nature than those relating to dressing, undressing, toileting, and provisions for self-reliance in eating and a lower per cent agreement is, therefore, not surprising.

It appears from these data that it is not difficult to obtain a relatively high agreement on the more concrete details of parental practices but that agreement becomes more difficult to achieve as the items become more abstract. This finding will be corroborated in the analysis of the remaining items on the two forms and of the agreement between the records and interviews.

"Medium Factual" Items

Question	Per Cent Agreement		
	Group I	Group II	Total Group
Child usually feeds himself (willingly, unwillingly)	100	87	
At times child wants to use something belonging to other members of the family (such as something belonging to mother, dad, brother, or sister). Does he get permission from the owner before he takes or uses such things? (usually, more than half of the time, less than half of the time, seldom)	100	100	
Child rests or sleeps during the day (usually, about half of the time, seldom)	93	93	
Where does child keep his things when not in use (usually in the place fixed for them, almost anywhere, wherever he happens to be, seldom in the place fixed for them, some other place)	87	100	
Child usually comes to his meals (willingly, unwillingly) when called	93	93	
Child usually goes to bed about 6:00, 6:30; 7:00, 7:30, 8:00, 8:30, later than 8:30; my child usually gets up in the morning about 6:00, 6:30, 7:00, 7:30, 8:00, 8:30, later than 8:30	100	87	
The time of going to bed at night varies from day to day from 0 to 15 minutes; 15 to 30 minutes; 30 to 45 minutes; 45 to 60 minutes; 1 hour or more. The time of getting up in the morning varies from day to day 0 to 15 minutes; 15 to 30 minutes; 30 to 45 minutes; 45 to 60 minutes; 1 hour or more	100	93	
Do you or some other person usually have to feed your child (the entire meal, half of a meal, food he dislikes, none of the meal)	100	100	
Your child wants to use something belonging to persons outside the family. Does he get permission from the owner? (usually, about half the time, seldom)	93	87	
How often does your child lose his temper? (about once a day, less than once a day, more than once a day)	93	73	
Mean	95.9	91.3	93.6
Extent of Self-Reliance in Dressing			
Child usually takes off his shoes without help	100	93	
Child usually unlaces his shoes without help	100	100	
Child usually puts on his shoes without help	100	93	
Child usually laces his shoes without help	100	100	
Child usually puts on his stockings without help	93	100	
Child usually takes off his stockings without help	100	100	
Child usually takes off his suit (dress) without help	100	100	
Child usually puts on his pajamas without help	100	80	
Child usually takes off his pajamas without help	93	100	
A low wash bowl is available so child can wash his hands and face	100	100	
Child usually takes off and puts on his cap without help	87	100	
Child usually takes off his rubbers and galoshes without help	100	100	
Child usually puts on his coat or playsuit without help	100	80	
Child usually puts on his rubbers and galoshes without help	100	90	
Mean	98.1	95.4	96.8

Medium Factual Items

The data as to the agreement between the responses to the medium factual items on the two forms are given on pages 58 and 59. In general, the agreements are again relatively high.

In this group is one item which may on first thought be classified as definitely factual. This is the item relating to the time of going to bed and the time of getting up. Since the per cent of agreement was determined, however, by considering a range (that is, if the number of hours in bed on the two forms checked within an hour, the responses were considered as agreeing), this item was classified in the medium factual group.

General Appraisal Items

The data for the general appraisal items are given below. In general, agreement in this group is somewhat lower than in either the definitely factual or the medium factual group. On the first three items which relate to feeding, dressing, and washing, the agreement is fairly high. On the remaining items it drops. These data would tend to indicate that parents are more consistent in their appraisal of the child's progress in activities involved in the daily routine than in such areas as controlling anger, controlling fear, learning property rights, distinguishing truths from untruths, and growing in leadership.

Agreement Between Interview and Records

The agreement between the data obtained in the interview and those obtained on each of the records for all items is given in Table 1. An analysis of the data in Table I indicates that a relatively high agreement was obtained on the items concerned with specific types of procedure. Only two types of items tend to present difficulty. The first type is illustrated by the question in which the subject was

GENERAL APPRAISAL ITEMS

Question	Per Cent Agreement Group I	Group II	Total Group
My child is learning to feed and care for himself at meals (about as quickly as a child of his age should, less quickly than a child of his age should)	100	100	
Appraisal of Progress in Toileting			
My child is learning to dress and undress himself as quickly as he should	100	100	
My child is learning to wash his hands and face about as quickly as heshould	100	100	
Obtaining Permission for the Use of Others' Property			
Child is learning the difference between his property and that of other people about as quickly as a child of his age and ability should			
Suppose you found that your child was often coming home with modeling clay belonging to a neighbor child. Suppose your child has no clay. What would you do? (Make your child take the clay back to the child, tell him he is a bad child, take the clay back to the child yourself, make him say he is sorry he took the clay, pay no attention to it, buy him some clay, give him a spanking)	93	93	
Child who often takes things which don't belong to him is told he will go to jail, the police will come and take him away. Do you say such things to your child if he takes something which belongs to someone else?			
My child loses his temper (more often than I think is good for him, less often than I think is good for him, about as often as I think is good for him, I do not know whether my child loses his temper more or less often than is good for him)	87	73	
My child tells things which are not true (more often than a child of his age should, about as often as a child of his age should; Child usually stays close to the facts of a story or an experience. I do not know whether my child tells things which are not true about as a child of his age should)	73	80	
When should child be depended upon usually not to have accidents during the day? (a) for bowel movements, (b) for urination	93	93	
When should child be depended upon usually not to have accidents during the night? (a) for bowel movements, (b) for urination	100	87	
My child has fears which I think are harmful for him and I am trying to help him get over being afraid; I am not certain whether my child has fears which are harmful for him	93	67	
Does your child boss, take the lead and direct others (more than you think is good for him, about as much as you think is good for him, less than you think is good for him, I do not know whether it is the amount which is good for him)	73	67	
Mean	92.7	86.8	89.7

TABLE 1

PER CENT AGREEMENT BETWEEN FORM A AND INTERVIEW AND FORM B AND INTERVIEW

Item	Form A and Interview Group I	Form A and Interview Group II	Form A and Interview Total	Form B and Interview Group I	Form B and Interview Group II	Form B and Interview Total
Provisions for Helping the Child Feed Himself						
Small knife, fork, and spoons are provided	93	100		100	100	
A low table and a low chair	100	100		100	100	
Apron or a bib which the child can put on himself	93	93		100	93	
A table covering which is easily cleaned	93	100		100	93	
High chair with short legs, youth's chair, or junior chair	100	100		100	100	
Dishes which are not easily broken	100	100		100	100	
Mean	96.5	98.8	97.6	100	97.7	98.8
Provisions for Helping Child Dress and Undress Himself						
Large buttons ½ inch (give diagram) and larger	100	93		100	100	
Zipper fastenings	100	93		100	100	
Rubbers in bloomers and underwear	100	100		100	100	
Clothes which fasten in the back	100	93		100	100	
Slip on garments which need no fastening	100	100		100	100	
Clothes which button in the front	100	93		100	100	
Shoe strings with tips; unbroken shoe strings	100	93		100	100	
Mean	100	95	97.5	100	100	100
Description of Child's Fears						
Dogs	100	93		100	100	
Fire	93	53		100	87	
Strangers	100	100		100	100	
Thunder	100	100		93	100	
Cats	100	100		100	100	
Dark	100	100		100	100	
Doctors	100	100		100	100	
Fur	100	100		100	100	
Deep water	93	73		100	100	
Wind	100	93		100	100	
Loud noises	100	93		87	93	
Lightning	100	100		100	100	
Falling from something which is some higher than ground or floor	93	80		93	93	
Mean	98.4	91.1	94.8	97.9	97.9	97.9
Provisions for Prevention of Fears						
We do not talk about any fears which adult members of the family have	87	87		93	87	
All adult members of the family try to overcome their fears	80	80		87	80	
If there are situations which may cause fear, I tell my child about them before; for example, if my child needs the doctor, I tell him that the doctor may hurt, but the doctor does it to help make him better	93	53		93	60	
All adult members of the family try at least to control and conceal their fears	73	80		93	73	
Mean	83.2	75.0	79.1	91.5	75.0	83.2
Provisions for Developing Self-Reliance in Washing						
Low wash bowl	100	100		100	93	
Ladder, stool, steps, or a block in front of wash bowl	93	93		80	93	
Wash basin and a pitcher of water on a low table	93	87		100	80	
Child uses an ordinary chair to reach the wash bowl	93	93		100	100	
Low hooks or a rack so child can get his own wash cloth and towel and hang them up	100	87		100	93	
No special things available	100	not used		100	not used	
Mean	96.5	92.0	94.4	96.7	91.8	94.4

TABLE 1 (Continued)

PER CENT AGREEMENT BETWEEN FORM A AND INTERVIEW AND FORM B AND INTERVIEW

Item	Form A and Interview Group I	Form A and Interview Group II	Form A and Interview Total	Form B and Interview Group I	Form B and Interview Group II	Form B and Interview Total
Obtaining Permission for Using Others' Property						
At times your child wants to use something belonging to other members of the family, such as something belonging to mother, dad, brother, or sister. Does he get permission from the owner before he takes or uses such things? (usually, more than half of the time, less than half of the time, seldom)	87	93		87	93	
Extent of Self-Reliance in Feeding						
Do you or some other person usually have to feed your child (the entire meal, half of a meal, food he dislikes, none of the meal)?	100	100		100	100	
Property Rights Outside the Family						
Sometimes your child wants to use something belonging to persons outside the family. In such cases does he get permission from the owner? (usually, about half the time, seldom)	100	60		93	67	
Regularity of Day Sleep						
Child rests or sleeps during the day (usually, about half of the time, seldom)	100	93		93	93	
Extent of Child's Temper Tantrums						
About how often does your child lose his temper? (about once a day, less than once a day, more than once a day)	100	67		93	73	
Putting Away Playthings						
Where does child keep things when not in use? (usually in the place fixed for them, almost anywhere, wherever he happens to be, seldom in the place fixed for them, some other place)	100	100		87	100	
Amount and Regularity of Night Sleep						
Child usually goes to bed at about 6:00, 6:30, 7:00, 7:30, 8:00, 8:30, later than 8:30. Child usually gets up in the morning about 6:00, 6:30, 7:00, 7:30, 8:00, 8:30, later than 8:30	100	87		100	100	
The time of going to bed at night varies from day to day from 0 to 15 minutes; 15 to 30 minutes; 30 to 45 minutes; 45 to 60 minutes; 1 hour or more	100	100		100	93	
Extent of Self-Reliance in Feeding						
My child usually feeds himself (willingly, unwillingly)	93	93		93	93	
Suppose it is meal time and you or someone tells your child that the meal is ready. Does he usually come (willingly, unwillingly)?	100	93		93	100	
Mean	97.5	89.6	93.5	93.9	91.2	92.5
Self-Reliance in Dressing and Undressing						
Child usually takes off his shoes without help	100	93		100	100	
Child usually unlaces his shoes without help	100	100		100	100	
Child usually puts on his shoes without help	100	100		100	93	
Child usually laces his shoes without help	100	100		100	100	
Child usually puts on his stockings without help	100	100		93	100	
Child usually takes off his stockings without help	100	100		100	100	

TABLE 1 (Continued)

PER CENT AGREEMENT BETWEEN FORM A AND INTERVIEW AND FORM B AND INTERVIEW

Item	Form A and Interview Group			Form B and Interview Group		
	I	II	Total	I	II	Total
Child usually takes off his suit (dress) without help	100	93		100	93	
Child usually puts on his pajamas without help	100	93		100	87	
Child usually takes off his pajamas without help	100	100		93	100	
Child usually takes off his coat or playsuit without help	100	100		100	90	
Child usually takes off and puts on his cap without help	100	100		87	100	
Child usually takes off his rubbers and galoshes without help	100	93		100	93	
Child usually puts on his coat or playsuit without help	100	100		100	80	
Child usually puts on his rubbers and galoshes without help	100	90		100	93	
Mean	100	97.1	98.0	98.1	95.9	96.5
Parents' Appraisal of Child's Growth						
My child is learning to feed and care for himself at meals (about as quickly as a child of his age should, less quickly than a child of his age should)	100	100		100	100	
My child is learning to dress and undress himself as quickly as he should	100	100		100	100	
My child is learning to wash his hands and face about as quickly as he should	100	100		100	100	
My child is learning the difference between his property and that of other people about as quickly as a child of his age and ability should	93	100		100	100	
My child loses his temper (more often than I think is good for him, less often than I think is good for him, about as often as I think is good for him, I do not know whether my child loses his temper more or less often than is good for him)	93	87		93	73	
My child tells things which are not true more often than a child of his age should, about as often as a child of his age should. My child stays usually close to the facts of a story or an experience. I do not know whether my child tells things which are not true about as a child of his age should.	100	87		73	93	
At what age do you think your child should be depended upon usually not to have accidents during the day?						
(a) for bowel movements	87	93		80	93	
(b) for urination	93	80		93	93	
At what age do you think your child should be depended upon usually not to have accidents during the night?						
(a) for bowel movements	93	87		93	80	
(b) for urination	93	67		93	80	
My child has fears which I think are harmful for him and I am trying to help him get over being afraid. I am not certain whether my child has fears which are harmful for him.	93	87		100	67	
Do you think your child bosses, takes the lead and directs others (more than you think is good for him, about as much as you think is good for him, less than you think is good for him, I do not know whether it is the amount which is good for him.)	87	80		87	80	
Mean	94.3	89.0	91.6	92.7	88.2	90.4

asked to indicate what procedures are followed in preventing development of fears and on which the agreement between the interview and Form A is 79 per cent and that between the interview and Form B 83 per cent. The methods are derived directly on Form B and indirectly on Form A. An indirect approach was used in the interview. Under these conditions both forms give about the same relatively low agreement with the interview.

The second type of item which tends to show disagreement is that relating to the parent's appraisal of the child's growth. For those phases of development involving the parent rather immediately and directly, such as growth in self-feeding, in learning to dress and undress, and in toileting, the agreement is fairly high. On items relating to the child's emotional and social development there is considerably less agreement. An analysis of the data obtained in the interview tends to indicate that the cause lies in the fact that parents have less clear an idea as to what they expect of the child or what they consider favorable progress in the latter type of item. This in turn seems to be the result of having been less directly affected by the child's social and emotional growth than by his growth in daily routines. The latter seem to have monopolized the attention with rather definite expectations. The former have not entered the sphere of concern to such an extent. Hence, they are much less consistent in their appraisal.

In general the data on Table 1 indicate that under the conditions prevailing in this study it is possible to obtain data on written forms which agree fairly closely with similar data obtained in the interview. Since the record method is so much more economical, it would appear worth while to extend the work by developing further methods of constructing adequate, duplicate disguised questions covering the significant aspects of parents' practices with children, and by testing the method in other areas of scientific investigation.

Summary

In this phase of the investigation a study was made of the extent to which record forms consisting of duplicate-disguised questions can be used in obtaining descriptions and measurements of parents' practices and parents' appraisals of the child's growth. The record forms were first developed with a group of twelve subjects varying in social and educational status to remove the major language difficulties.

Data were obtained on the duplicate forms and by the interview method for two groups of fifteen subjects each, one group high in the economic and educational scale and the other group low in the scale. Analyses of the agreements between the two forms and between each form and the interview were made for the individual items.

The important findings are as follows:

1. A high degree of agreement was obtained on the duplicate forms for items concerned with relatively concrete and specific details of parents' practices. These agreements average approximately 95 per cent.

2. More abstract phases of parents' practices, such as methods used in developing an understanding of property rights and in preventing the development of fears, showed somewhat lower agreements.

3. Items relating to parents' appraisal of their child's growth in emotional and social development tended to show a lower per cent of agreement than items relating to the appraisal of the child's growth in self-feeding, dressing, and toileting.

4. Similar measurements were obtained when each record was compared individually with the interview. The proportion of agreements is relatively high except for two types of items, those relating to the more subtle phases of parental practices such as methods employed for preventing the development of fears, and items of the appraisal type relating to a child's growth in learning to distinguish property rights, in learning to distinguish truths and untruths, in learning to lead and direct, and in developing emotional control.

PART III

INTEGRATION OF BEHAVIOR FACTORS AND EMOTIONAL CONTROL

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The phrase "to integrate" may be defined as "to form into one whole" or "to combine several elements into a complex entirety." Applied to the factors underlying behavior,

it centers the attention upon the way in which the several elements are combined in the total performance. There are many aspects to the problem of integration, and a consideration of one or two will further assist in clarifying the concept.

The most obvious is probably the presence or absence of conflicts and their general nature. There may be conflicts between various desires. There may be conflicts between desires and the resources available for carrying out the desire, such as when one wishes to do something and does not have the knowledge, skill, or emotional control essential. There may be conflict between the combination of desire and resources and what the environmental conditions permit when considered in the light of the individual's equipment. An example of the latter type of conflict is found in the case of an individual who is willing and able to perform a certain task but who is prevented by someone with authority over him.

There are also numerous possibilities as to methods of resolving conflicts. A conflict between desire and resources, for example, may be resolved by lowering the desire. This may also occur between desire and environmental limitations. In other cases the resources of the individual may include a forward looking attitude with the result that the momentary conflict stimulates a seeking to acquire the necessary skill or knowledge or other type of resource to carry out the desire. In still other cases an imaginary world may be created.

In addition to the conflict aspect of integration, there are such problems as the nature of the hierarchy of desires and the degree of separation between the various members of the series; the type of interrelationship existing between such factors as knowledge and attitude, knowledge and emotional control, etc., and the influence of changes in one behavior factor upon the total structure.

The purpose of the first part of this study is to determine the adequacy of a technique for detecting conflicts and for revealing the general method of resolution. The experimental situation set up for this purpose seemed to present an excellent opportunity for testing various measures of emotional control. The data relative to measures of emotional control will be found in the second part of this section.

The general method for both parts of the study consists (1) of determining the reliability of various measures of conflict and of emotional control, (2) of selecting those that show a reasonably high reliability, and (3) of comparing these measures with the behavior of a group of subjects as determined by observation and interview.

Method of Investigating Conflict and Resolution of Conflict

The method devised by Luria (5) for the study of affective conflicts consists essentially in having the subject respond orally to a word association test and synchronize a simple voluntary act with this response. The latter consists in pressing a membrane with the finger at the moment the response is given. Luria's assumption is that by uniting the language response and motor reaction into one unit or system, the changes or alterations in the central processes will have an influence upon the total structure; and by analyzing the reactions, an indication of the structure of the internal processes can be obtained.

For the study of conflict, an adaptation of the Luria procedure was employed. Three types of material were used to bring the central processes into play: (1) a word association test using a portion of the Jung list and a list of words pertaining to the interaction of parent and child, (2) items from the Pressey Cross-Out test, and (3) questions of the neurotic inventory type. In the last case, questions from the Thurstone neurotic inventory were used supplemented by a number of questions dealing directly with the parent's reaction toward the child.

Method of Studying Emotional Control

In the general method of studying conflict which has just been described, the processes which are brought into play may or may not be accompanied by an emotional response. In the emotionally uncontrolled individual there would be a greater tendency for a given mental process or conflict to produce at least an incipient emotional reaction than in the emotionally controlled or stable individual. The experimental situation thus created for the study of conflict seemed to afford an excellent opportunity to study emotional control.

Numerous measures for detecting incipient emotional responses have been investigated,

varying from measures of facial expression and vocalization to changes in hydrogen ion concentration of body fluids. None of these has proved satisfactory to all workers. Selecting one type of physiological process or one type of measure assumes that the expression of emotion will follow approximately the same pattern in all individuals. When one considers the enormous possibilities of the nervous system, this assumption is not supported.

It would appear desirable, therefore, to take account of the individualizations of patterns by developing a combined score. At the beginning of the study it was planned to use two types of measures: changes in blood pressure and changes in body resistance. In the time available it was not possible to develop a satisfactory method for making continuous measures of blood pressure (the Erlanger method is not well adapted to continuous measurements, as several writers have pointed out), and it was decided to use changes in body resistance with the expectation that higher relationships might be found if a combination measure could be used.

In this study it was assumed that incipient emotional responses may involve changes in muscle tension. The literature has pointed out that very probably changes in body resistance are closely related to changes in muscle tension. If the latter comprise one phase of incipient emotional responses, then changes in resistance should be related to the degree of emotional control exercised by the individual.

Experimental Procedure

Since the measurements of conflict and of emotional control were made on the same subjects and at the same time, the details of the two procedures will be considered together.

Selection of Subjects

The subjects of this study were twenty-six mothers of children between the ages of one and seven years, representing various occupational and cultural levels. All of them had had either a high school or some college education.

Testing Procedure

It was desired to obtain records of voluntary movements, involuntary movements, reaction time, verbal response, and variations in body resistance. The records were obtained as follows:

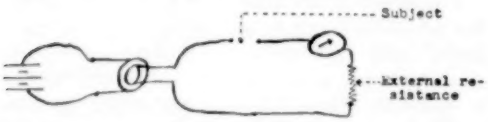
Voluntary Movements.—The subject rested the arms comfortably on a table with the forefinger held just above a rubber membrane stretched over a cup approximately 1½ inches in diameter and 2 inches high which in turn was attached to a writing tambour. All of the records were taken on a record tape moving at a known constant speed. The subject was instructed to press the membrane the moment the oral response was given. The regularity or irregularity can thus be studied from the written record.

Involuntary Movement.—In the procedure described by Luria a record of involuntary movements was obtained by asking the subject to hold with the forefinger of the unoccupied hand a membrane attached to a written tambour at constant pressure. In this study it was desired to obtain measures of body resistance by attaching electrodes to the palm of the hand. In order to leave one of the hands free for this purpose, a record of involuntary movements was obtained by having the subject place one foot on a rubber bulb attached to a writing tambour and asking the subject to maintain a constant pressure on this bulb throughout the testing period. For this purpose a rubber bulb 1½ inches in diameter and 3 inches in length was placed beneath the ball of the foot.

Reaction Time.—The experimenter pressed a key operating an electric magnet equipped with a writing pen at the moment the stimulus word was spoken to the subject and released the key at the moment the subject responded. Since the paper tape on which the records were made was moving at a constant known speed, the time could be calculated from the difference in distance between the movement of the pen or closing the circuit and the movement on opening the circuit.

Changes in Body Resistance.—The subject was placed in circuit with a Weston milliammeter with a built-in rectifier, a resistance box calibrated from zero to 100,000 ohms in 2,000 ohm steps, and a source of alternating currents of 16 volts. As a source of current it was found unsatisfactory to use the 110 volt 60 cycle supply with a transformer since the voltage was not sufficiently constant. A dry cell radio battery delivering 16 volts, together with a commutator driven by a synchronous

motor, was used. The complete circuit is represented in the following diagram:



The electrodes consisted of two brass plates 1 by 1½ inches in size and placed ¼ inch apart on sponge rubber approximately 1 inch thick. This was strapped to the palm of the subject's hand. The purpose of the sponge rubber was to maintain an approximately constant pressure.

The method of measuring changes in resistance is as follows: The resistance of the subject is first measured. Approximately one-fifteenth of the initial resistance was used as the unit of change. Thus if the initial resistance of the subject was 45,000 ohms, each change of 3,000 ohms was recorded. The recording was done by attaching to a pointer swinging immediately above (and independently of the indicator on the meter) a writing pen and operating this pointer manually. Each time the indicator showed a change of 3,000 ohms in the above case, for example, the auxiliary pointer was moved and a corresponding record was made.

Verbal Response.—The experimenter, who sat at the table with the subject, recorded the verbal response on a convenient form.

Testing Procedure

When the subject came to the laboratory, the general nature of the apparatus was explained and the motor driving the polygraph was turned on so as to accustom the subject to the noise. In order to put the subjects at ease, they were assured both at the time the appointments were made and before the beginning of the experiment that their records would be kept confidential and that they were primarily for the purpose of testing the reliability and validity of various procedures.

The subject was then asked to take a comfortable seat at the other table in the room. The apparatus was placed on one table in such a way that no portion of the record was visible to the subject. Two experimenters were present. One operated the motor and the device for recording changes in body resistance. The other sat down beside the subject, attached the electrodes to the nonpreferred hand of the subject, assisted in placing the subject's foot on the bulb for recording involuntary movements, and demonstrated the method for making voluntary movements.

The tests were given in the same order for each individual. The test itself was composed of an association test of 100 words, seventy-five words from the Pressey X-O test, and seventy-nine questions of which the greater part were selected from the Thurstone Neurotic Inventory supplemented by items dealing directly with parent-child relationships.

Description of the Individual Tests

Association Test.—The simple word association test comprised 100 words, fifty selected from the Jung list and fifty chosen for their obvious bearing upon parent-child relationships. The subjects were given the following directions:

You will seat yourself comfortably at the table and sit directly in front of it. Rest both arms on the table. I am going to attach this (the electrodes) to your left hand. Does this feel comfortable? (experimenter adjusts electrodes if necessary) Place your left foot on the bulb beneath the table and press lightly (subject was directed to press harder if necessary in order to distend the tambour to about three-fourths of its limit). You are to keep this pressure throughout the experiment. I am going to give you a series of words. You are to say the first word that comes to your mind. Do not try to select a word but give the first one that occurs to you. At the same time that you say the word press the piece of rubber with the forefinger of your right hand (or left if preferred).

Now let us try a sample or two. Press the rubber with your finger and release it. Let your finger rest very lightly on the rubber after you have pressed it.

I will give you a few words to practice with. When I say the word you answer aloud the first word that you think of and at the same time press the rubber with your right forefinger. Ready? (words, pencil, day, and up were used) Do you understand the directions?

Pressey X-O Test.—In one part of the original X-O test, the subject is instructed to cross out any words about which he has ever worried. It was not possible to include the entire list as this would make the procedure

too long. The first twenty-five words were, therefore, chosen. The following directions were used:

In the words which I am going to give you now you are to say whether you have worried about the item named. You are to say "worried" or "not worried" and at the same time press the piece of rubber with your right forefinger.

A similar procedure is followed in selecting the words from Part IV of the Pressey X-O test. The directions were as follows:

I am going to give you a list of words and you are to say whether each of these has a "pleasant" or "unpleasant" meaning to you. If it has neither you are to say "neither." When I say the word, you say "pleasant," "unpleasant," or "neither" and at the same time press the piece of rubber with the right forefinger.

In each case the twenty-five words were presented orally and the subject asked to respond as indicated in the directions.

Neurotic Inventory Questions.—Seventy-nine questions taken for the most part from the Thurstone Neurotic Inventory and supplemented by questions dealing more directly with parent-child situations were presented orally and the responses of the subjects were recorded as in the other phases of the study. The following directions were given the subject:

Now I am going to ask you some questions. When you give your answer, press at the same time the piece of rubber with the right forefinger.

Procedure for Obtaining Ratings

Two types of ratings were desired—a rating of the relative presence or absence of unresolved conflict in the mental life of the subject and a rating of the emotional control exercised by the individual. The latter may be explained as follows: An individual who is readily disturbed emotionally, who reacts emotionally even when minor difficulties arise between himself and the child, would be rated as relatively unstable. An individual who does not become disturbed unless the conflict becomes severe or of a major character would be rated as relatively stable.

Twenty-one of the twenty-six subjects were judged to be sufficiently well known to the investigators to give a reasonable basis for the ratings. In a few cases an acquaintance was deliberately cultivated by informal interview and co-operation on a simple project.

The ratings were made by two investigators, both with extensive training in psychology. A seven-point scale was used. Step 1 represented, in one case, relative freedom from unresolved conflict and in the other, relative emotional stability. The final ratings represent the average of the two observers. To avoid fractions, Step 1 was taken to include one and one and one-half, Step 2 two and two and one-half, etc.

Scoring.—Three numerical scores were obtained for each of the tests: reaction time, number of disturbances in voluntary movements, and number of changes in bodily resistance. It will be recalled that a record was also made of involuntary movements and it would be possible to include the number of disturbances in this record. These were, however, so few in number that it did not seem worth while to include them.

The reaction time was determined by measuring the distance the tape traveled between the time the stimulus word was given and the response of the subject.

Disturbances in voluntary movements were obtained by counting the number of such disturbances and dividing this sum by the number of words in the test if it is desired to obtain an average. The changes in electrical resistance were obtained by counting the number of times changes of a given magnitude occurred.

In addition to these scores it is possible to treat the oral responses of the subjects in various ways. In the first scoring of the first part of the Pressey X-O test the total number of words to which the subject responded "worried" were counted. This score was called "Affectivity Score I." The second score, "Affectivity Score II," was derived by counting the number of words to which the subject responded "worried" plus the number of the remainder in which disturbances in the voluntary movements appeared. It was assumed that if the subject wished to conceal the true situation, a conflict might appear.

A similar scoring was adopted for the second group of items selected from the Pressey X-O test. First the total number of words to which the subject responded as "unpleasant" were calculated. This was known as "Affectivity Score I." "Affectivity Score I"

plus the number of responses in the remainder showing disturbances in voluntary movements was called "Affectivity Score II."

Neurotic Inventory

As in the case of the other tests, the subjects were given two scores on the oral responses. In the neurotic inventory the so-called emotionally unstable response is sometimes the affirmative and sometimes the negative. By counting the total number of so-called neurotic answers as determined by the scoring key, Personality Score I is derived. Personality Score II is equal to Score I plus the number of questions among the remainder showing disturbances in the voluntary movements.

Analysis of Results

Reliability of Measures

To determine the reliability of the various measures, odd and even items were correlated on various parts of the test. Another type of testing reliability consists of a correlation of the data obtained upon retesting ten subjects approximately a week after the first test was given. Since the entire test is relatively long, it would be difficult for the subjects to respond on many items through sheer recall.

A correlation of odd and even items on various parts of the test is given in the tabulation below:

Measure	Correlation
Reaction time (Jung list)	.94 ± .02
Reaction time (words relating to parent-child interaction)	.88 ± .03
Reaction time (neurotic inventory)	.90 ± .03
Disorganization of voluntary movements (Jung list)	.94 ± .02
Disorganization of voluntary movements (words relating to parent-child interaction)	.87 ± .03
Disorganization of voluntary movements (neurotic inventory)	.88 ± .03
Variations in resistance (Jung list)	.92 ± .02
Variations in resistance (words relating to parent-child interaction)	.87 ± .03
Variations in resistance (neurotic inventory)	.88 ± .03

It will be seen that all of the correlations are reasonably high, the lowest being .87. As indicated by these data, therefore, the measures show an encouraging degree of reliability. The correlations of the results between the first and second administration of the tests are given in the following tabulation:

Measure	Correlation
Reaction time (Jung list)	.87
Reaction time (words relating to parent-child interaction)	.86
Disorganization of voluntary movements (Jung list)	.84
Disorganization of voluntary movements (words relating to parent-child interaction)	.84
Variations in resistance (Jung list)	.87
Variations in resistance (words relating to parent-child interaction)	.85

It will be seen that these correlations are also fairly high and while they are somewhat lower than the correlations of odd and even times, they are not significantly lower. The reliabilities obtained in this study compare favorably with those reported by Houtchens (2) in a study of delinquents. On the basis of these data we may say at this point that whatever the various measures singly or in combination represent, they yield data that are sufficiently reliable to make further analysis worth while.

Correlation of Measures With Conflict Ratings

In the description of the general method it was indicated that subjects were given a rating as to the relative freedom from unresolved conflicts, especially conflicts involved in parent-child relationships. To what extent do the various measures correlate with these criteria? The data are given here:

Measure	Correlation
Disorganization of voluntary movements (Jung list)	.83 ± .05
Disorganization of voluntary movements (words relating to parent-child interaction)	.85 ± .04
Disorganization of voluntary movements (neurotic inventory)	.73 ± .07
Reaction time (Jung)	.43 ± .12
Reaction time (words relating to parent-child interaction)	.59 ± .10
Reaction time (neurotic inventory)	.46 ± .12
Variations in resistance (Jung list)	.23 ± .14
Variations in resistance (words relating to parent-child interaction)	.39 ± .13
Variations in resistance (neurotic inventory)	.21 ± .14
Affectivity score II (pleasant and unpleasant)	.30 ± .14
Affectivity score II (worried and not worried)	.39 ± .13
Personality score I	.29 ± .14
Personality score II	.49 ± .11

Of the twelve measures listed, the number of disorganizations in voluntary movements show the highest relationship. The disturb-

ances in voluntary movements on the neurotic inventory test correlate somewhat lower than those of the word association test, but they are all relatively high. Next in order come personality scores and several measures of reaction time.

The data point to some interesting interpretations which may be noted in passing. It makes little difference whether words from the Jung list or words pertaining to parent-child interaction or questions of the neurotic inventory type are used in considering disturbances in voluntary movements. The tendencies to conflict tapped by the test appear somewhat generalized since they tend to appear in the processes stimulated by a variety of material.

In a simple test of the type used in this study, measures may be derived which bear a fairly high relation to indications of conflict as obtained through extended observations or interviews. While the study should be extended, especially as to the improvements in the ratings which should be made by a larger number of individuals representing greater diversity in training, nevertheless these preliminary data indicate that several of the measures, such as the disorganization in voluntary movements, personality score, and reaction time, may be useful as a simple test to supplement the interview in this area. When the two facts of reliability and correlation with the criterion are considered together, the evidence supporting this statement becomes relatively strong.

Correlation of Measures With Ratings of Emotional Control

The correlations of various measures with ratings of emotional control follows:

Measure	Correlation
Variations in resistance (Jung list)	.62 ± .09
Variations in resistance (words relating to parent-child interaction)	.66 ± .10
Variations (neurotic inventory)	.76 ± .06
Reaction time (Jung list)	.53 ± .11
Reaction time (words relating to parent-child interaction)	.59 ± .10
Reaction time (neurotic inventory)	.60 ± .10
Disorganization of voluntary movements (Jung list)	.29 ± .14
Disorganization of voluntary movements (parent-child interaction)	.26 ± .14
Disorganization of voluntary movements (neurotic inventory)	.44 ± .12
Affectivity score I (worried and not worried)	.04 ± .15
Affectivity score II (worried and not worried)	.14 ± .15
Affectivity score I (pleasant and unpleasant)	.23 ± .14
Affectivity score II (pleasant and unpleasant)	.25 ± .14
Personality score I (neurotic inventory)	.54 ± .11
Personality score II (neurotic inventory)	.56 ± .10

An analysis of the data shows that a number of the correlations are fairly substantial. This is true of variations in resistance reaction time and personality scores I and II. The correlations of variation in resistance on the neurotic inventory with the ratings exceed somewhat the correlations of measures in the word association test, although the differences are not statistically significant.

It was indicated previously that, since emotional expression may become considerably individualized, probably a single measure of physiological change would not correlate highly with the criterion. Variations in body resistance as a single measure of physiological change correlates encouragingly high. Whether a combination of physiological measures would improve on this remains for future studies to determine. The data here presented give considerable encouragement that a simple test may be developed for differentiating individuals exercising a relatively high degree of emotional control from those manifesting a relatively low degree of such control.

Other Aspects of Integration

An analysis of the verbal responses was made to determine their usefulness in revealing additional characteristics of integration. The method of classification and its application follow.

Classification of Responses

Some meaningful method of grouping was found necessary in order to interpret the verbal responses. Preference was given to the classification by the Kraepelin Aschaffenburg scheme as adapted by Jung in his "Studies in Word Association." For the purposes of this study, the Jung classification was too detailed to be reliable as measured by the results of two observers. While adhering to the major principles of the scheme, the categories were nevertheless simplified by in-

corporating many subgroupings into the major categories. In this way the scheme became less complicated and more reliable. The system of classification used in this study is as follows:

I. Inner Association—Co-ordination

Co-ordination includes all associations which are conjoined by co-adjunction, contrast, predicate relationship, and causal dependence.

1. Co-adjunction

Under co-adjunction are classified all associations containing an intrinsic relationship; that is, terms based upon some generic idea to which both are related. The terms which are contiguous in thought, words mutually related, are all included in this category. Examples:

Word	Response	General Concept
blue	yellow	color
cow	horse	animals
pond	river	water
stealing	lying	ethical standards

2. Contrast

The relationship implied in contrast demands very little elucidation. The concept embraces words similar in some respects and yet strikingly different, a diametrical opposition existing between similar things.

Examples:

Stimulus	Response
dead	alive
long	short
obey	disobey
anxious	not anxious

3. Predicate

In the predicate category are included all deductions, appraisals, valuations, and activities which in any way relate to the stimulus word as the subject or object. This category is subdivided into two classes: inner predicates and outer predicates.

a. Inner predicate.—Inner predicate is classified into judgment of fact and judgment of value.

(1) Judgment of fact

These words are purely objective in character, expressing an important and intrinsic constituent of the stimulus. Examples:

Stimulus	Response
salt	bitter
winter	cold
wound	raw

(2) Judgment of value

In these responses the personal element is defined without alluding directly to the ego in the guise of a desire, inclination, or self-defense, that is, wholly in an introspective fashion. Examples:

Stimulus	Response
mother	good
stealing	bad

b. Outer predicate.—Outer predicate reactions convey an outer but somewhat significant characteristic of the stimulus-image.

Stimulus	Response
box	long
flower	red

4. Causal Dependence

Stimulus words and reactions united by a causal relationship are classified in the category *causal dependence*. Examples:

Stimulus	Response
wound	blood
pain	tears

II. Outer Association

The second major category is designated as outer association and is subdivided into co-existence, word complement-change, and motor speech forms.

1. Coexistence

Coexistence unites words not influenced purely by similarity or affinity but by the connection of ideas through frequent concurrent appliance; that is, ideas occurring together in time or space, or in both.

Examples:

Stimulus	Response
ink	pen
table	chair
doctor	hospital
religion	church

2. Word Complement-Change

The reaction word protracts the stimulus word into another complete word. The reaction may take several forms (e.g., the stimulus word is repeated in the reaction or the reaction is only a grammatical modification of the stimulus word). Examples:

Stimulus	Response
smart	smartness
street	car
ink	bottle

3. Identity

The reaction alludes to no further expansion or evaluation of the impact or essence of the intent of the word but is a more or less equivalent or synonymous expression for the stimulus word. Examples:

Stimulus	Response
bad	mean
behind	in back of
dumb	stupid

4. Motor-Speech Forms

In this subdivision are embodied all those connected responses which have become automatic through continual linkage in speech, connected through frequent usage in daily expression, proverbs, etc. Examples:

Stimulus	Response
stubborn	mule
pride	prejudice
bread	water
dead	buried
hunger	suffer
sad	weary

III. Sound Association

The reaction is impelled exclusively by the resonance and clangor of the initiation of the stimulus word. Rhymes are also included under sound association. Examples:

Stimulus	Response
bake	cake
blue	bloom
clean	cling

IV. Indirect Association

Any connection which is only apprehended by the supposition of a mediate word diverse from the stimulus and reaction word is called an indirect association. Jung believes that clang or sound accounts for the majority of indirect placements of association. Examples:

Stimulus	Response
embarrass	bad story
behind	walking

V. Egocentric Reactions

Reactions reflecting a tendency to express individual feelings, desires, judgments, etc., betray the subjects as interpreting every stimulus as a personal reference; that is, in their subjectivity, the subjects cannot conceive of any word as possessing an objective meaning but must in some way refer it to themselves. Examples:

Stimulus	Response
nag	no
nervous	sometimes
boy	two
dumb	no
emotion	yes
doctor	nice

VI. Fault

All omitted responses are signified as a fault reaction. The cause of the failure or neglect to respond is commonly due to an emotional blocking.

Analysis of Verbal Responses

What virtue does the classification of verbal responses serve and what light does it throw on the individual's mode of reaction which cannot readily be ascertained in the other data? The possibilities of the analysis will be shown by examining several of the case studies.

Inner Association

Case 16: By examining Figure 1 it is seen that Case 16 is characterized by a large number of inner associations due to the extremely large proportion of contrast associations. This subject had several years of college training, taught school, and during the experiment kept her attention at a very high level, yet the mode of reaction was very crude. The following reactions illustrate this stereotyped mode of response.

Stimulus	Response
anxious	not anxious
talking	quiet
bossing	not being bossed
dressing	undressing
afraid	unafraid

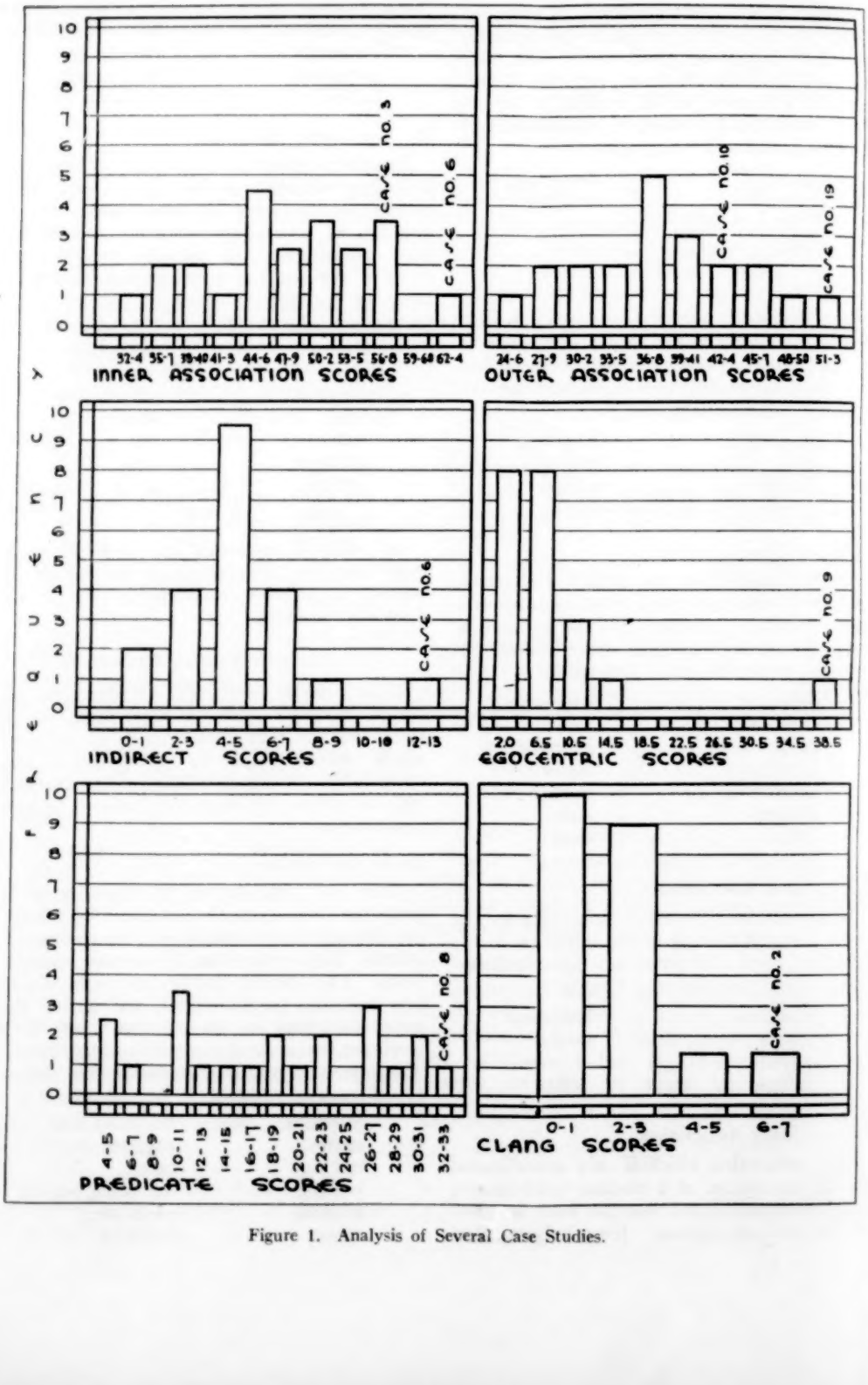


Figure 1. Analysis of Several Case Studies.

A disturbance is evidenced relating to the subject's weight which makes her sensitive to any reference to physical build. Such a disturbance is revealed by a large number of omissions. Examples:

Stimulus	Response
emotion	fault
bashful	fault
nag	fault
embarrass	fault

The simple constellation can also be seen from the following reactions:

Stimulus	Response
weight	dieting
calories	dieting
bread	fattening
food	calories

These data correlate with the picture gained from observation of and conversation with the subject. The subject was rated as having little individuality. Although showily dressed and pleasant, she was not impressive. She replied in stereotyped fashion, even in conversation, obviously exerting very little mental effort. Her paucity of vocabulary was throughout patent. She displayed little knowledge concerning parent-child relationships and less aptitudes for parental guidance as shown by the following verbal responses to the neurotic inventory. Examples:

Question: Let's say you have a three-year-old. Suppose you have callers in the front room. Your child comes walking in without any clothes on. How would you feel?
Answer: Rather embarrassed.

Question: Would you make an explanation to the guest?
Answer: I don't know.

Question: What would you say to the child?
Answer: Take him away.

Question: What would you do to the child?
Answer: Just talk.

Question: Suppose your child, having studied faithfully, received only low marks in school. Would you be very depressed?
Answer: Yes.

Question: Would you scold him?
Answer: I'd try not to.

Case 3: Another example of inner association is found in Case 3. (Figure 1) The associations are characterized by a large number of coadjuncts which in turn are of a superior and richer type. It is Jung's contention (3) that educated individuals usually give outer associations. He explains this partly on the assumption that the educated are stronger in disguising and inhibiting their own wishes and evaluations than are the uneducated or those of a lower mental caliber. From the data derived in this case we find this hypothesis unreliable. The subject motivated by a scientific and keen interest in the study kept her attention at a high level throughout the experiment, paying marked attention to the meaning of the word rather than to its external nature. These data corroborate the findings in the personal interview since the subject was characterized by the observers as having a healthy natural mind distinguished by openness and inspirations from without. The superior mode of speech evidenced by the observers in conversation was also carried over into the experiment resulting in a superior type of association.

Outer Association

Case 19: Relative to the other cases, Case 19 stands out with a preponderance of outer associations because of the large number of verbal-motor forms. (Figure 1) The entire analysis of this case is characterized by a superficial type of reaction. Both in the interview and during the experiment, the subject's attention was easily diverted. She interrupted the experimental procedure several times to ask irrelevant questions. She did not reply to the point either when asked questions directly by the interviewer or when answering questions on the test. She revealed a disturbance regarding pride, self-status, both in having worried about certain items and in responding as she did to word stimuli.

Examples:

Stimulus	Response	
blushing	shame	distress
self-consciousness	nervous	hurt
discouragement	pride	self-esteem
injustice	bossing	shamed

The subject appeared in the interview to have experienced some distress arising possi-

bly from a situation in which she might have been intimidated, humiliated, or affronted. In the responses to questions of the neurotic inventory type we discern this shying away from society which might have been the result of an unpleasant experience. Examples:

Question: Do you ever feel that you are not satisfactorily adjusted to life?
Answer: Yes.
Question: Are you interested in meeting a lot of different kinds of people?
Answer: No.
Question: Can you stand criticism without feeling hurt?
Answer: Not very well.
Question: Do you worry over humiliating experiences?
Answer: Yes.
(These responses accompanied by delayed reaction time)

Case 10: Another case study in outer association and one differing from Case 19 is Case 10 whose cultural and intellectual level is far above the average. This subject is actively interested in social welfare and participates in related activities to a large extent. She possesses a high moral interest, earnest feeling, and is strongly charged with an enthusiasm for lofty principles. She has the kind of ingratiating personality which has often been mistaken for affectation. Her dominant interest in people and humane rights are shown in the following reactions:

Stimulus	Response
poor	salaries
hunger	industrial people
pray	church school
bossing	the political boss

These responses reveal the attitudes and interests of the subject, the awareness of social machinery in relation to people, their needs, and the like. Revealing the same tendency, the subject responded as having worried about the following:

injustice	boss
sickness	enemies
money	religion

The subject is vitally concerned about her own family. Reference by proper names to her own husband and children occurs very frequently.

With respect to parent-child interaction, the subject evidently tried very hard to apply to her problems the most up-to-date knowledge and to guide her children according to the best principles of child development. The following examples will illustrate this:

Question: Recall one of the times lately when your child kept asking you questions and you were very busy. What were you doing?
Answer: Making out the menu.
Question: How did it make you feel?
Answer: Couldn't stop at the moment but tried to interest child and asked him to wait. (Subject had to be reminded several times to answer questions either by *yes* or *no* or confine herself to more concise answers)
Question: Do you feel that you treated the child the way he should have been treated?
Answer: Not quite but I try.
Question: Suppose you do not have the money to buy your child ice cream cones, toys, and other little luxuries that the neighbor's children have. How do you feel about this?
Answer: Substitute and try to make them understand.

Indirect

Case 6: The indirect reaction type of Case 6 is distinguished from the other subjects by a preponderance of indirect associations. (See Figure 1) This subject in the preliminary observations manifested curious characteristics which were puzzling to the investigators. She seemed to lose direction of her own discourse many times. During the interview a definite tendency was marked toward a sudden wandering of attention and abruptness of response caused by several emotional disturbances as the data will reveal. Several egocentric reactions are present referring in a derogatory manner to an evaluation of the subject herself.

Stimulus	Response
dumb	me
stubborn	me

A conflict is very obvious, both in the length of reaction time and in the repetition of the response. The following reactions illustrate this disturbance which deals with the subject's

child. (These responses were not given in the order listed.)

Stimulus	Response
bed-wetting	baby
anxious	baby
dead	baby
sad	mother
wound	birth
afraid	baby
sex	baby

This conflict may be connected with a conflict in the home environment. The subject did not respond to the following stimuli:

Stimulus	Response
quarreling	fault
nervous	fault
nag	fault
bossing	fault

The subject was very eccentric. She manifested particular glee in answering "yes" to such a question as, "Do you occasionally have conflicting moods of love and hate for members of your family?"

Investigators were aware that at the time of this experiment the subject was badly in need of money, both she, her husband, and the baby occupying one room. The subject seemed to blame her living under these adverse circumstances upon her husband (marriage).

She made a high personality score as determined by the number of maladjusted answers. These are not accompanied, however, by any emotional upheavels on the record. She seemed to be resigned and at the same time completely indifferent to everything, as if her spirit of initiative was shattered. She displayed a peculiar intermingling of intelligence with a reversion to crudeness. Examples:

Question: How did it make you feel when your child kept asking you questions and you were very busy?
Answer: Quite griped.
Question: Try to recall one of the times that you saw a snake. What did you do?
Answer: Went out and urped.

Dissatisfaction with her life-situation is manifested in the following answers:

Question: If you could be free to come and go as you like or have children which would require that you stay home part of the time, which would you choose?
Answer: To be free.
Question: Do you have to stay home more than you would like to?
Answer: Yes.

Several indirect associations seem to be the result of an emotionally and vividly charged stimulus-image. Example:

Stimulus	Response
baby	dead

Egocentric

Of the various categories considered, the egocentric reactions of the subjects examined (See Figure 1) are of particular interest for the wide discrepancy shown between the majority of egocentric reactions and that of the one sole subject, Case 9. From the beginning of the interview, the investigators became aware of a certain sensitivity in the subject. Rapport with her was not as easily established as with the other subjects. The investigator had to administer the questions tactfully. The stimulus-word was absorbed in a conversational manner, the subject replying to the majority of word-stimuli as if they were personal hints, the experiment thus becoming a direct interplay of words between the experimenter and the subject. Each word was received as an interrogation. If the subject had at any time been aware of the purpose of the study and possessed interest in it, this motive had during the experiment regressed wholly into the background. While the subject is mentally quite healthy, this type of reaction reflects an abnormal tendency, that of using self as the origin, the reference point upon which everything else revolves. Nothing in her case is purely objective; nothing is capable of analysis without some personal reference to her own interest, her desires revealing responses intimately connected with her own previous emotional experiences:

Stimulus	Response
embarrass	no
emotion	yes
contrary	sometimes
love	much
family	three
nervous	sometimes
afraid	no
doctor	nice
hungry	sometimes

Predicate

Case 8 is most characteristic of the predicate type. (Figure 1) Subject was quite demure and a little stiff in manner. She seemed at the beginning a little uncertain and vague as to the experimental purpose and did not follow directions capably. Her mind was characterized by logic-tight compartments. She had a tendency to separate things into categories. Everything had a definite value attached to it. Examples:

Stimulus	Response
family	what means most
marry	responsibility
sex	unpleasant necessity
hunger	something wrong
love	responsibility
baby	someone to love
street	something to be careful of
girl	something that belongs to me

She worried about the following word-stimuli:

money	self-consciousness
operation	sickness
clothes	

Examples of the words responded to as unpleasant:

divorce	hug
extravagant	dancing
sex	flirting
smoking	jealousy
breast	

This subject reveals certain fixed concepts; she is too completely sheathed in her habits to make re-education very easy. She believes her duty to husband amply fulfilled in taking care of the home and children. While seemingly happy and concerned about home and children, the subject evidences a conflict concerning sex, which she feels is ignoble and negligible. The following responses reveal that the subject perhaps feels slightly infringed upon:

Stimulus	Response
sex	unpleasant necessity
love	responsibility
marry	responsibility

She is easily depressed about home and children. Example:

Question: Suppose your child, having studied faithfully, received only low marks in school. Would you be very depressed?

Answer: Yes.

Question: How do you feel when your child asks you questions concerning sex?

Answer: Worried.

Question: Suppose you do not have the money to buy your child ice cream cones, toys, and other little luxuries that the neighbor's children have. How do you feel about this?

Answer: Distresses me.

The large number of predicates is due to the judgments of value.

Clang

Case 2 gave the largest number of clang reactions. (Figure 1) This subject became quite friendly with the investigator, laughed, and seemed to be enjoying herself. The subject's complete lack of self-consciousness was striking throughout interview. She had had little education but was in comfortable financial circumstances. She seemed eager to be able to give her child all the opportunities which she felt she had missed but was not in the least self-critical or self-reproachful because of her own admitted intellectual handicap. She seemed very happy and well satisfied that she could give her child a good education. During the experiment the subject's attention was easily distracted. As a result of linguistic difficulty, her reactions were very crude, the subject paying more attention to the outer form of the word or the sound of it than to the meaning inherent in the word.

Examples:

Stimulus	Response
stealing	bad
lying	bad
nervous	nerve
habit	good

The following are characteristic of the clang reactions:

Stimulus	Response
baby	boy
green	screen
smart	smile

During the interview the subject expressed a rather questionable feeling toward her mother-in-law who was at the time living with the subject. In the experiment this feeling is shown by the number of faults and responses involving domestic relations.

Examples:

Stimulus	Response
nag	fault
emotion	fault
love	fault
family	own group
bossing	mother-in-law

This conflict was not accompanied, however, by a marked disturbance. The subject seemed to feel capable of some method of resolution of conflict.

It is interesting to note the mode of reaction in dealing with parent-child interaction. The very frankness of her responses may be ascribed to utter lack of self-consciousness. She was not for a moment doubtful as to whether or not she had responded adequately.

Question: Try to recall one of the times lately when your child wouldn't eat. How did it make you feel?

Answer: Mad.

Question: Did you tell him to keep still?

Answer: Yes I did.

Question: Try to recall one of the times lately when your child wouldn't eat. How did it make you feel?

Answer: If he *was* hungry he could eat.

Question: Do you think your child is born to be a leader?

Answer: I hope so.

Question: What kind of work would you like to have your child do when he grows up?

Answer: President.

Question: Would you like to see your child become president?

Answer: Sure. (Only subject who responded emphatically in the affirmative to this question)

During the interview, the subject spoke very enthusiastically to the interviewer of preschool, expressing happiness that her child was attending and talking of her plans for him.

Summary

The purpose of this study is to determine to what extent a series of simple tests which can be administered without an exceptionally high degree of skill can be used to obtain measures of tendencies to conflict and degree of emotional control. For the study of conflict, an adaptation of the Luria procedure was employed. The central processes were brought into play by using three types of material: a word-association test using a portion of the Jung list and a list of words bearing upon the interaction of parent and child, selected items from the Pressey X-O test, and questions from the neurotic inventory type. For the latter the Thurstone Neurotic Inventory was used, supplemented by a number of questions dealing directly with the parent's interaction with the child. Measures of disturbances in voluntary movements, reaction time, and verbal responses were obtained. In the same experimental situation, measurements were made of the changes in body resistance during the time the test was administered. A total of twenty-six mothers of children ranging from one to seven years of age and representing various occupational and cultural levels served as subjects. The important findings are as follows:

1. Measures of reaction time, disorganization of voluntary movements, and variations in resistance all show a very satisfactory degree of relationship as shown by the correlation of odd and even items and the correlation of retests on a small group of subjects. The correlations ranged from .84 to .94.

2. Of all the various measures considered, the disturbances in voluntary movements correlated highest with the conflict ratings. These correlations vary from .73 on the neurotic inventory to .85 on the group of words relating to parent-child interaction.

3. Measures of changes in resistance and personality score on the neurotic inventory correlated highest with ratings of emotional control. These correlations range from .56 to .76.

4. An analysis of the verbal responses yields valuable data for further analysis of the integration of behavior factors. These data tend to indicate that simple tests of the type used in this study may ultimately be developed to a point where they may be used as a substitute for an extended interview procedure. Although the study should be extended

especially as to the method of obtaining ratings for which a larger number of individuals representing a greater diversity of training should be used, the combined data of reliability and correlation with the various criteria presented in this study indicate that equally reliable and less time-consuming methods can be developed as substitutes for the interview.

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AMOUNT AND RATE OF TALKING OF YOUNG CHILDREN*

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The amount, rate, and quality of verbal output in children represent distinctive and interesting features of development. An extensive literature is available on vocabulary, average length of sentence, and sentence structure. McCarthy (5) has summarized 236 studies concerned with the language development of children. Amount of talking, in absolute rather than in relative units, has received slight attention, and rate practically none. Interest in the amount of talking as a factor in individual differences and as an attribute of social behavior is apparent in a number of the investigations.

Fisher (3, p. 67), with the aid of stenographic records, has secured data showing an increase in the mean number of remarks per child per hour in a group of preschool children. Smith (8, p. 17), using abbreviated longhand recording, reports a regular rise in the total number of words per hour from about seventy-eight words at two years to a figure which is stabilized at approximately 400 words between three and one-half and five years. Relative measures of talkativeness have been secured by time-sampling techniques by Goodenough (4), Arrington (1), and Robinson and Conrad (7). The present study presents a technique for securing a quantitative statement of amount and rate of talking in young children where the qualitative analysis of vocabulary and sentence structure is not desired.

SUBJECTS

Two groups of children enrolled in the senior nursery and kindergarten of the University Elementary School were observed during the school year 1932–1933. The number of boys and girls in each group in the study is noted in connection with later tables. At the time the investigation was begun, the ages of children in the nursery ranged between forty-six and fifty-seven months with a mean of fifty-one months. The kindergarten children were between fifty-eight and sixty-nine months with the mean at sixty-three months. The mean age for all subjects was fifty-seven months. The children came primarily from families in the professional and business categories. The selection is further indicated by a mean intelligence quotient of 124. The results should be viewed from the standpoint of methodology and trends rather than for the establishment of central tendencies and variations for random samples of children.

METHOD AND CONDITIONS OF OBSERVATION

The amount and rate of talking were determined by a numerical count of words spoken. The word seemed to be the smallest practical unit for work under the conditions for record making. Any words, exclamations, or jumbles of sounds produced by the children in word play were counted, but incomprehensible sounds such as grunts, followed by no word, were not counted. Contractions were counted as one word and hyphenated forms as two words. The count was objectified by the use of a mechanical hand tally[1] and a time-out stop watch.[2]

The junior writer, who was also the observer, first practiced counting words in adult conversations and in the spontaneous talk of children in the school setting. Counts were also made for persons engaged in oral reading in order to make a comparison with a fixed standard. After a small amount of practice, the count of the observer agreed very closely with the actual number of words read. In twelve samples of reading, the Pearson coefficient of correlation between the measure as determined with the mechanical counter and the actual number of words in the book was .99. The count usually agreed exactly or varied only by a few words. A constant error in the direction of underestimation was

* From the child development laboratories of the University Elementary School, University of Michigan. The writers are indebted to Elizabeth Mechem Cunningham, research assistant in child development, for editorial work on the manuscript.

[1] Manufactured by Veeder Root, Inc., Hartford, Connecticut.
[2] Number 20211, manufactured by C. H. Stoelting Company, Chicago, Illinois.

evident, but the mean amount was only 1.4 words in twelve samples of reading with a mean length of 144 words.

After the preliminary practice, the observer proceeded with the systematic collection of data in the school setting. Records for the study of amount were taken in two one-minute observations per day on fifteen different days, distributed over ten weeks, for a total of thirty observations. The children were observed one after another in approximately alphabetical order to be sure that no bias was entering in the choice of order for the observation. No particular need for rotation in order was apparent.

The data on rate of talking were secured after the close of the period devoted to records of amount. The technique employed was to stop and start the time-out stop watch until thirty seconds of constant talking had been recorded with the hand tally. Six thirty-second samples were recorded for each child with observations distributed over a period of six weeks and with no more than one record per child on a given day. The total observational time thus involved in the measurement of rate is but three minutes obtained in six thirty-second samples. The approach of the close of the school year necessitated this meager sampling and reduced the reliability of the measures that could be secured.

It will be noted that the figures on amount are concerned with verbal production in a given amount of elapsed time while those for rate are based on actual talking time. For convenience, values have been calculated and discussed in terms of words per minute in the text.

Observations were made under conditions of indoor free play between nine and ten o'clock in the morning in the kindergarten and between two and three o'clock in the afternoon in the senior nursery. These periods were chosen since there was little adult direction or intervention. It was thought that, since the limitation of samples was necessary, such periods would be most representative. A possible constant error attributable to diurnal variations in talking is uncontrolled for any comparisons that may be made between the two groups.

The records secured have been examined from the point of view of individual differences, reliability, validity, and interrelationships.

Individual Differences in the Rate and Amount of Talking

The child who talks the most will talk approximately seven times as much as the child who talks the least during a given period of time (Table 1). The most rapid talker uses a rate which is about 1.4 times as fast as the slowest talker (Table 2). Although boys tend to speak less than girls during given periods of time, when they do talk it is at a slightly more rapid rate. The average boy in the study produces 15.3 words at a rate

Table I

Group, Sex, and Individual Differences in Amount* of Talking

Sex	Number	Mean	Median	Standard Deviation of Distribution	Range
	Senior Nursery Group				
Boys	9	505.3	449.0	125.9	268 to 682
Girls	8	546.9	531.0	205.0	290 to 899
Total	17	524.5	485.0	154.6	268 to 899
	Kindergarten Group				
Boys	7	398.7	395.0	188.6	131 to 621
Girls	10	516.6	516.0	220.2	223 to 947
Total	17	468.2	463.0	209.9	131 to 947
	Combined Groups				
Boys	16	458.6	456.5	157.7	131 to 682
Girls	18	531.2	516.0	202.1	223 to 947
Total	34	496.5	474.5	186.0	131 to 947

*Scores are the total number of words spoken in thirty minutes of elapsed time (made up of thirty one-minute observation periods). In the text the figures have been translated into words per minute.

TABLE II

GROUP, SEX, AND INDIVIDUAL DIFFERENCES IN RATE* OF TALKING

Sex	Number	Mean	Median	Standard Deviation of Distribution	Range
	Senior Nursery Group				
Boys	8	552.2	558.0	31.5	509 to 607
Girls	8	538.9	536.0	30.2	495 to 595
Total	16	545.5	544.5	31.5	509 to 607
	Kindergarten Group				
Boys	7	577.6	586.0	48.5	477 to 642
Girls	7	569.0	605.0	65.6	456 to 628
Total	14	573.3	595.0	56.5	456 to 642
	Combined Groups				
Boys	15	564.1	566.0	42.2	477 to 642
Girls	15	552.9	546.0	52.2	456 to 628
Total	30	558.5	563.5	47.1	477 to 642

*Scores are the total number of words per three minutes of actual speaking time (made up of six thirty-second observation periods). In the text the figures have been translated into words per minute.

of 188 words per minute, while the average girl speaks 17.7 words at the rate of 184 words per minute.

The total verbal output under the conditions of observation decreases in the kindergarten as compared to the senior nursery, but the rate of talking increases. Thus the typical senior nursery child has a verbal output averaging 17.5 words per minute of observation at a rate of 181.8 words per minute of actual speaking time, while the typical kindergarten child has a verbal output of 15.6 words per minute[3] at a rate of 191.1 words per minute of actual speaking time. The difference between kindergarten and nursery groups may be situational rather than developmental.

Within each group there is some tendency for the older children to talk more than the younger. The coefficients between amount and age are .34 ± .14 and .28 ± .15 for nursery and kindergarten respectively. The relationships between age and rate are equivocal with corresponding values of —.38 ± .14 and .27 ± .17.

RELIABILITY OF MEASURES

The reliability of the records on amount of talking was studied by correlating the total of the fifteen odd observations with the fifteen even observations and by correlating the first fifteen scores in the series with the score obtained in the last fifteen. In the kindergarten the odd-even technique yields a coefficient of correlation of .87 ± .04, which becomes .93 when corrected for the whole series. The correlation between the first and second half of the series is .72 ± .08, which becomes .84 when corrected. The corresponding values in the senior nursery are .79 ± .06, corrected .83, and .67 ± .09, corrected .80. The evidence thus indicates greater agreement when the records are divided so as to give a sample of the whole series than when the element of constancy is also introduced by comparing the scores obtained during the first part of a series spread over several months with scores obtained during the latter part.

Because of the small number of observations and the more complex problem of recording, the data on rate are not as accurately determined as the data on quantity. Rate was determined from only three minutes of observation of speaking time, while thirty minutes were used to obtain the measure of amount. The odd-even correlation is .89 ± .04 with a corrected value of .95 in the kindergarten. The correlation between the first and second halves is .44 ± .15 with a corrected value of .61. In the senior nursery, corresponding correlations are odd-even .42 ± .14, corrected .59, and the correlation between first and second halves .79 ± .06, corrected .83. The writers recommend the use of a greater number of time samples in order to stabilize the figures on rate.

[3] Smith's (8) figures translated to a comparable basis give a value of slightly less than seven words per minute for the same ages. It appears probable that the difference is methodological, although the situations and children sampled may not be comparable.

The Validity of the Method

The validity of the measurement data secured is intrinsic within the limits of the reliability of the method and the situations sampled. Since the sampling is limited, however, further research would need to be done on the generality of the index secured. To determine the extent to which the data based upon direct observation of action would correlate with the impressions of teachers, the coefficient of correlation was calculated between the scores on amount and rate of talking with the teachers' ratings for item 15 on the Haggerty-Olson Wickman Behavior Rating Schedule, which asked the question, "Is he quiet or talkative?" Answers are scaled through five degrees: Speaks very rarely, usually quiet, upholds his end of talk, talks more than his share, jabbers. Positive correlations of insignificant size were secured. The particular rating scale approach cited injects a social interpretation in the sense of appropriateness of the verbal output to the situation. In a subsequent investigation (2), however, a revised graphic rating item was employed with the question, "What is the quantity of the child's verbal output?" Here again five degrees were stated: Speaks very rarely, tends to talk less than most children, talks about as much as the typical child, talks somewhat more than most children, inclined to talk much of the time when with others. A mean rating by two teachers on this scale was demonstrated to have an appreciable positive relationship of .40 and .73 in nursery school and kindergarten respectively with quantity of talking as determined by the same method as that employed in the present study.

Interrelationships

Intelligence quotients as secured with the Kuhlmann-Binet tests correlate .14 $\pm$ .11 with amount of talking and —.02 $\pm$ .12 with rate. In the absence of contrary evidence obtained with larger number, it is tentatively assumed that no judgment of a child's mental capacity at these ages and in the upper ranges of mental ability can be made from observation on the quantity or the rate of his talking. It should be noted that this investigation made no attempt to secure a measure of quality as secured in relevance, vocabulary, sentence structure, or similar indices.

Is the child who speaks the most rapidly also the one whose verbal output is greatest in a given period of time? The coefficient of correlation between quantity and rate in this investigation is .13 $\pm$ .12, from which it must be concluded that there is no very close relationship. The amount spoken during the actual speaking time is a direct function of rate. Quantity during longer periods of elapsed time, as in this study, is dependent on the individual and situation in a complex and only partially understood manner.

Summary

With the aid of time-sampling techniques, a mechanical hand tally, and a time-out stop watch, data were secured on the amount and rate of talking for two groups of nursery school and kindergarten children. The combined data indicate that children at these ages with observations made under conditions of indoor free play have a verbal output of about 16.5 words per minute at a rate of 186 words per minute while speaking. These values are considerably higher than previous figures reported where attempts were made to take complete notes.

Individual differences are pronounced, and the child who talks the most will talk approximately seven times as much as the child who talks the least during a given period of time. Boys tend to speak less than girls during given elapsed periods of time, but when speaking do so at a more rapid rate.

The reliability of thirty one-minute samples for amount is .93 in the kindergarten and .83 in the senior nursery. The observations on rate are dependent upon a total time sample of three minutes. The reliability coefficients vary between .59 and .95 depending upon group and method of computation. The observations for amount of words spoken give an appreciable correlation with ratings on quantity of verbal output as made by teachers. The correlation of rate and amount with such factors as age and intelligence are negligible or ambiguous. The child who talks the most does not necessarily speak at the most rapid rate. The total output is a function of other factors.

The success of the method should warrant its use on larger populations and in the description of growth and experimental differences in situations.

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THE INFLUENCE OF NURSERY SCHOOL ATTENDANCE UPON THE BEHAVIOR AND PERSONALITY OF THE PRESCHOOL CHILD*

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Periodically in the literature of child development, articles appear in which attempts to determine the influence of the nursery school upon the accomplishment level of the young child have been made. This article may be classed as another such attempt.

Although largely tentative in its conclusions, the present study is submitted here since it seems to supplement in several ways the work of previous investigators. The majority of the investigations which have dealt with nursery school influence have been based upon IQ changes in the child (2, 7, 9, 12, 19, 20, 21, 23). A few suggestive studies have dealt with the influence of the nursery school upon physical health and development (1, 6, 11, 16, 17). Studies of the influence of the nursery school upon behavior and personality have, with three exceptions, been limited to a consideration of social adjustments.

The three exceptions mentioned are discussed below. Two of these (11, 15) yielded no clear-cut results. The published version of the third study is extremely brief and contains no data for statistical evaluation of the findings.

The present study is based upon ratings from an original scale which contains sixty behavior items indicative of routine habits as well as personality characteristics. The general scope covered by the present investigation includes: eating, sleeping, elimination, nervous tendencies, speech, fears, relation to adults, relationships with other children, and general personality and emotional reactions. In its greater number of cases and its slightly different method, it also supplements the preceding investigations.

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REVIEW OF PREVIOUS INVESTIGATIONS

Only studies pertaining to the effect of the nursery school upon social and personality adjustments are reviewed in the present section. The bibliography contains a list of the research studies which have appeared to date on all phases of nursery school evaluation.

Influence of the Nursery School Upon Social Development

The studies of Parten (15), Mallay (13), Walsh (18), Green (8), and Cushing (5) contain data on the extent, if any, to which nursery school attendance furthers social development.

Parten secured sixty one-minute observations of social participation for each of thirty-four nursery school children over a six-month period (January to June). She found no significant relation between social participation and nursery school attendance when she correlated social participation scores with date of entrance to nursery school. When she analyzed successive observations, she found a tendency for the May and June observations to show more associative and co-operative play and less unoccupied, solitary, and onlooker behavior than did the January and February reports. This suggests an improvement in social participation during the nursery school year, but the lack of controls makes it impossible to judge whether the increased social participation was due to nursery school attendance or to the naturally developing capacities of the children. The insignificant correlation mentioned above would tend to support the latter point of view.

Parten (14) has also studied leadership over a six-month period in the nursery school. The study indicated that during the six-month period the children tended to find their places as either followers or leaders and to main-

tain that position rather constantly. No general tendency for the nursery school to facilitate or hinder development of leadership was noted.

Mallay (13) based her study of the relation between nursery school attendance and social contacts upon twelve five-minute samplings taken in the fall and again in the spring for each of twenty-one nursery school children. She made separate analyses for the two-, three-, and four-year-olds. For each age group Mallay found consistent increases in the number of social and group contacts[1] and in the success of social contacts from fall to spring. However, lack of controls makes it impossible to determine the relative parts played by nursery school and by developmental factors in bringing about these changes.

Certain judgments on social adjustment were contained in the scale used by Walsh (18). The effect of the nursery school can be more safely judged from this study than from those previously discussed, since Walsh compared the ratings for twenty-two children in nursery school over a six-month period with a group of twenty-one controls (1) who had had no nursery school experience and (2) who were matched with the nursery school group for chronological age, intelligence, general physical development, and home background (Taussig classification). Walsh reports better social adjustment on the part of the nursery school group. The items on which this conclusion is based include: "approaches others readily," "is cordial to strangers," "is considerate of younger children," "exhibits responsibility for safety of other children," "respects property of others," "is sympathetic when stranger feigns weeping," and "shares toys of others." The investigator states that her scores are statistically valid, but the printed report contains no data for judging the reliability of the separate items.

Cushing (5) included social adaptability among the traits which she rated in comparing children with and without nursery school experience. The printed report does not indicate any marked difference between the two groups on this characteristic.

Green (8) compared two groups of kindergarten children, one with and one without nursery school background. Her results are based (1) on special ratings at the beginning and end of the semester on a scale of social adjustment and (2) on a report card of social traits. She reports that the group with nursery school experience was more independent, showed more poise, and needed less control in choice of activities, choice of routines, and the making of social contacts than did the other children. She does not present findings for specific traits and does not include statistical data in her report.

In general, the studies in the present section give a suggestion, but little conclusive evidence, that nursery school attendance may further social development over and above the developmental factor.

Studies Indicating the Influence of the Nursery School Upon Other Aspects of Personality Development

The studies by Kawin and Hoefer (11), Cushing (5), and Walsh (18) touch upon other phases of personality than social adjustments.

Of these three studies, that by Walsh is most suggestive. This study, as previously stated, is based upon a comparison of scores on the Bonham Sargent Scale for two matched groups, one containing twenty-two children who had attended nursery school over a six-month period, the other containing twenty-one children who had had no nursery school experience. The published account is brief and no reliability data are given.

We have already indicated that Walsh found greater sociability in the nursery school than in her control group. Another interesting finding was that the nursery school group was less inhibited than the controls. Types of behavior on which this judgment was based involved initiative, curiosity, and self-assertiveness. Specific items included: "does not wait to be told," "climbs for objects," "insists on rights," "resents interference," "self-dependent in play," "tendency to argue," "has fewer fears," "asks questions demanding explanations," and "finds how mechanical toys operate."

Walsh also found greater self-reliance in the nursery group as evidenced by such behavior as "puts toys away" and "keeps clothes in good condition." She explains her findings as "probably due to a great extent to the social force of a large group of children who had to adjust to each other constantly." (18, p. 72)

[1] Social contact—vocalization, parallel activity; group contact—two children spatially and functionally together.

Cushing (5) compared a group of thirty-three kindergarten children who had had nursery school experience with a control group with no nursery school background. The controls were not closely matched with the main group for age and intelligence. They averaged four months younger (a significant difference) than the main group in age and were also of lower IQ. Cushing obtained special ratings on the two groups for (1) health habits, (2) social adaptability, (3) use of environment, (4) personality traits, and (5) total adjustment to the group. She found no outstanding differences in the two groups in total adjustment and in attitudes, with the exception of a slight superiority on the part of the group with nursery school experience. (Such attitudes as enthusiastic, interested, indifferent, bored, rebellious were considered.)

Kawin and Hoefer (11) compared twenty-two nursery school children with a group of controls (matched for sex, chronological age, mental age, and similarity in physical status and home background) both at the beginning and end of the nursery school year. A rating scale which included routine habits and personality traits was used as one basis for comparison. The investigators made no detailed analysis of separate behavior traits since they felt that the data did not warrant this analysis. However, "when all habits were totaled, a larger percentage of nursery-school children than control-group children showed improvement in habit status. They eliminated a greater number of 'undesirable' habits and more habits which indicate a lack of independence; and, on the other hand, they acquired a greater number of 'desirable' habits and those indicating emancipation from adults." (p. 50)

Summary of Previous Investigations

From the foregoing discussion it would seem that our knowledge of the influence of the nursery school upon personality and behavior adjustments of the child is meager indeed. While most studies suggest increased sociability, self-expression, and self-reliance as a result of nursery school attendance, the data are largely tentative and few attempts at determining their statistical significance have been made.

Only two studies in this field have involved adequate controls, and each of these studies is based upon only twenty-one and twenty-two children in each group. Only one investigator has attempted to determine the influence of the nursery school on separate age groups, and that investigator worked with approximately seven children each at two, three, and four years of age and with only one aspect of behavior and personality, social contacts. Since age is recognized as such an important factor at the preschool level, this latter point (i.e., determination of nursery school influence for separate age groups as well as for all ages within the nursery school range) seems almost as necessary a check as does the control group. In the present investigation both checks have been used.

The Present Investigation

Subjects

It was impossible in the present investigation to secure a group of controls who had had no contact with the nursery school. Our data were consequently obtained from fall and spring ratings of the children enrolled in seventeen nursery schools[2] over a two-year period. From these data we were able to select two groups of 106 children each who differed in nursery school attendance but who were matched, child for child, for:

Chronological age (to the exact month)
Sex
Nationality and race
Economic level (determined arbitrarily by selecting each member of a pair from the same neighborhood)

The control group was composed of children who had been in nursery school just long enough so that (1) they had passed the initial stage of adjustment and so that (2) the teachers felt qualified to judge their behavior. Two weeks were accepted as the lapse of time necessary for meeting the first criterion and (since the rating scale was based on frequency of behavior during the past month) a subsequent period of four weeks was accepted as meeting the second criterion. On the basis of these points, each child in the control group was rated approximately six week after his entrance to nursery school. The exact mean attendance for the group of 106 children at the time of their rating was six weeks with a range from three to nine weeks. This group is henceforth to be called the six weeks group.

[2] Between 400 and 600 separate children were rated. Data on the age, sex, nationality, and economic level of the 335 children who were included in the first year's ratings are contained in a forthcoming report.

The six weeks group of children was compared with a group of 106 children who had been in nursery school on an average of nine months. The mean attendance was thirty-six weeks with a range, except for two cases, from twenty-eight to forty-four weeks.[3] All of the children in this latter group had had fairly regular attendance; none of them had been absent more than a total of two weeks since entrance to nursery school (with the exception of holidays), and none had had a continuous absence of more than a week at a time. Hereafter this group will be referred to as the nine months group.

The difference in nursery school attendance between the two groups is approximately seven and one-half months. While this is a short lapse of time within which to expect differences, it nevertheless involves the bulk of the school year (especially since summer programs, if they continue at all, are more likely to be informal play groups). This interval of time is also slightly longer than most of those used in previous investigations involving personality and social adjustments.

Data

Children in each of the two groups were rated on a specially devised form containing sixty behavior items indicative of routine habits and personality characteristics. Each judgment was based on the frequency with which the particular behavior had occurred in the past month: "never," "less than once a week," "once a week," "several times a week," and "daily or more." Each child was rated independently by three different nursery school teachers, and his final rating was an average of the three independent judgments.

Analysis of Data

In our present analysis we have considered a frequency manifestation of "several times a week" or "daily or more" as indicative of habitual tendencies and have compared the six weeks group and the nine months group in terms of the percentage of children in each who showed a given type of behavior to this degree.

There were three two-year-olds,[4] forty three-year-olds, sixty-two four-year-olds, and one five-year-old in each of the two groups. Obviously, not enough two- and five-year-olds were available to permit separate consideration. Separate as well as composite groupings of the three- and four-year-olds have been attempted in the comparisons. The other age groups have been included in the total or composite groupings.

Critical ratios are presented with all the percentages given in the accompanying tables. These figures were determined from nomographs given in Dunlap and Kurtz.[5] Standard errors proved too bulky for inclusion here and have consequently been filed with the original data. No refinement has been made in the data to account for the matching of the two groups. It is a well-established fact that the more closely two groups are matched in a study of this kind, the less the error is likely to be and the higher the reliability or significance of the differences. The critical ratios presented here, therefore, are to be considered only minimum indices of the differences existing. With these points in mind, the writer has rather arbitrarily looked upon 85 chances or more in 100 as the sign of a definite tendency, at least, in the data, and has considered such differences worthy of discussion.

Reliability of Data

Reliability of ratings was determined by comparing judgments made by the same teacher on the same child one week apart. Validity was determined by comparing judgments made by each teacher with the mean judgment of the three. The median agreement on the reliability measure was 85 per cent and the median agreement on the validity measure was 89 per cent. Detailed reports of the reliability and validity of the data are contained in a forthcoming report.[6]

The Findings

Social Adjustment

Table 1 contains an analysis of all behavior items observed in the two groups which are indicative of social adjustments.

General Tendencies.—From the table it appears that children are more sociable in their reactions after a longer attendance at nursery school. Such behavior as "fears strange people," "shrinks from notice," "avoids play with

[3] Two cases fall outside this range. One child had been in nursery school only twelve weeks; a second had had sixty-five weeks of nursery school experience.

[4] "Two-year-olds" is used to cover ages of one year, six months to two years, six months inclusive. The other age groupings cover a similar range.

[5] Dunlap, J. W., and Kurtz, A. K.: *Handbook of Statistical Nomographs, Tables and Formulas.* Yonkers-on-Hudson, N. Y.: World Book, 1932. Pp. x, 158.

[6] These data are now available at the Winnetka Public School Nursery.

TABLE 1

RELATION OF NURSERY SCHOOL ATTENDANCE TO SOCIAL RELATIONSHIPS

Behavior	Percentage: Six Weeks Group*	Percentage: Nine Months Group*	Difference	Critical Ratio**	Chances In 100
General Social Characteristics					
Fears strange people, objects, places					
Three-year-olds	.18	.03	—.15	2.30	99
Four-year-olds	.02	.02	.00	.00	50
Composite	.06	.02	—.04	1.50	93
Shrinks from notice					
Three-year-olds	.13	.05	—.08	1.29	90
Four-year-olds	.10	.02	—.08	1.95	98
Composite	.11	.03	—.08	2.57	99
Stays close to adults					
Three-year-olds	.08	.03	—.05	1.02	84
Four-year-olds	.10	.02	—.08	1.95	98
Composite	.10	.02	—.08	2.50	99
Reactions to Other Children					
Avoids play with others					
Three-year-olds	.15	.00	—.15	2.58	99
Four-year-olds	.18	.03	—.15	2.74	100
Composite	.15	.02	—.13	3.42	100
Gives in too easily					
Three-year-olds	.18	.08	—.10	1.37	91
Four-year-olds	.13	.03	—.10	2.04	98
Composite	.14	.05	—.09	2.31	99
Refuses to share					
Three-year-olds	.13	.08	—.05	.75	77
Four-year-olds	.13	.03	—.10	2.04	98
Composite	.14	.06	—.08	2.00	98
Grabs toys					
Three-year-olds	.15	.15	.00	0.00	50
Four-year-olds	.20	.07	—.13	2.08	98
Composite	.19	.10	—.09	1.91	97
Attacks others					
Three-year-olds	.13	.08	—.05	.75	77
Four-year-olds	.13	.05	—.08	1.53	93
Composite	.12	.09	—.03	.73	77
Reactions to Adults					
Ignores requests					
Three-year-olds	.15	.28	.13	1.44	93
Four-year-olds	.21	.24	.03	.40	65
Composite	.19	.26	.07	1.23	89
Seeks attention by showing off					
Three-year-olds	.13	.28	.15	1.73	96
Four-year-olds	.21	.21	.00	0.00	50
Composite	.18	.25	.07	1.23	89
Asks unnecessary help					
Three-year-olds	.10	.25	.15	1.81	96
Four-year-olds	.18	.18	.00	0.00	50
Composite	.12	.20	.08	1.60	94
Looks for praise					
Three-year-olds	.10	.30	.20	2.31	99
Four-year-olds	.20	.18	—.02	.29	62
Composite	.15	.24	.09	1.67	96
Criticizes others					
Three-year-olds	.03	.18	.15	2.49	99
Four-year-olds	.11	.11	.00	0.00	50
Composite	.09	.16	.07	1.52	93

*Number of cases in each age group: three-year-olds, 40; four-year-olds, 62; composite, 106.
**Standard errors for each percentage are on file at the Winnetka Nursery Unit.

other children," and "stays close to adults" is less for the group with the longer nursery school record. The decrease in "avoids play with others" is statistically reliable in the case of all three analyses (that is, for the three- and four-year-old groups as well as for the composite grouping). It indicates that the nursery school does influence social behavior over and above the improvement which would naturally come with age.

According to the table, attendance at nursery school tends to reduce "fear of strange people" for the three-year-old but not for the four-year-old group. The low percentage of four-year-olds showing this behavior indicates that "fear of strange people" is probably already at a minimum in the four-year-old group and hence can show no change with nursery school attendance. In this instance the nursery school, therefore, would seem merely to hasten the natural process.

The decrease noted in "stays close to adult" with nursery school attendance is probably a natural counterpart of increased play with other children and needs no further comment.

Reactions to Other Children.—The decreases in "avoids play" and "gives in too easily," already noted above, are healthy indications of improved social relationships following nursery school attendance. The changes are equally apparent for both the three-year-old and four-year-old groups.

While social interests tend to increase equally for three- and four-year-olds during the nursery school period, certain techniques in social adjustment show greater improvement for the four-year-old than for the three-year-old children. According to the table, "refuses to share," "grabs toys from others," and "attacks others" are considerably less for the four-year-old group with the longer nursery school experience (93 to 98 chances in 100 of a significant difference). This would suggest that not until they are four years of age have children matured sufficiently to get the most benefit from their contacts with other children in the nursery school.

Reactions to Adults.—Table 1 contains another rather striking fact. The three-year-old group with the longer nursery school attendance shows more dependence upon adults (i.e., more "seeks attention by showing off," "asks unnecessary help," "looks for praise," and "goes to adult with criticism of others" than does the three-year-old group which has just entered the nursery school. There are practically no differences between the four-year-old groups for these traits.

It would almost appear from these findings that the three-year-olds observed in this study made their adjustment to the nursery school by putting the teacher in the mother role, that they had not yet developed to the point where social contacts with other children met their needs as adequately as contacts with adults, or where they were able to find their exact place in the group. By four years of age the child's position in the group probably becomes better fixed. Hence we find (1) that the proportion of four-year-olds who are dependent upon adults at the beginning of the fall term lies midway between the number of three-year-olds who show dependence in the fall and the number of three-year-olds who show dependence in the spring, and (2) that it occupies that same position very closely from fall to spring.

"Ignores requests"[7] also shows a marked tendency to increase with nursery school attendance for the three year group and only a slight tendency to increase for the four year group. The possible explanation seems dubious unless, since it accords so well with findings for dependent behavior and since other measures of compliance revealed no relation to nursery school attendance, this is one other device used by three-year-olds to gain attention of the adult.

Expressive Behavior

The decrease with nursery school attendance of such behavior as "shrinks from notice," "avoids play with others," and "gives in too easily" (already noted, Table 1) indicates that social inhibitions decrease as a result of attendance at nursery school. The question remains as to whether other types of behavior indicative of inhibitions and tensions also become less with nursery school experience. These types of behavior are listed in Table 2.

General Reactions.—The general tendency for the types of behavior listed in Table 2 to occur less frequently for the nine months group than for the six weeks group indicates that inhibitions do decrease and that expressive behavior consequently does increase with stay in nursery school. The decrease in

[7] Two other types of negative behavior studied, "refuses to comply" and "hard to reason with," revealed no changes with nursery school attendance.

TABLE II

RELATION OF NURSERY SCHOOL ATTENDANCE TO BEHAVIOR INDICATIVE OF INHIBITIONS OR TENSIONS

Behavior	Percentage: Six Weeks Group*	Percentage: Nine Months Group*	Difference	Critical Ratio	Chances In 100
General Reactions					
Avoids risks					
Three-year-olds	.15	.10	—.05	.68	76
Four-year-olds	.16	.15	—.01	.15	56
Composite	.15	.08	—.07	1.56	94
Daydreams					
Three-year-olds	.10	.05	—.05	.85	80
Four-year-olds	.08	.08	—.10	1.66	96
Composite	.17	.01	—.16	3.81	100
Fears high places					
Three-year-olds	.15	.08	—.07	1.00	84
Four-year-olds	.10	.03	—.07	1.59	94
Composite	.07	.05	—.02	.53	71
Fears dark					
Three-year-olds	.04	.03	—.01	.24	60
Four-year-olds	.02	.00	—.02	1.05	85
Composite	.02	.01	—.01	.60	73
Nervous Tendencies**					
Twists hair					
Three-year-olds	.10	.03	—.07	1.27	89
Four-year-olds	.08	.03	—.05	1.22	88
Composite	.10	.04	—.06	1.71	96
Bites nails					
Three-year-olds	.00	.03	.03	1.20	88
Four-year-olds	.07	.02	—.05	1.43	93
Composite	.05	.03	—.02	.83	80
Tense at rest					
Three-year-olds	.20	.03	—.17	2.50	99
Four-year-olds	.16	.05	—.11	2.00	98
Composite	.19	.05	—.06	3.18	100
Plays with fingers					
Three-year-olds	.25	.13	—.12	1.40	92
Four-year-olds	.23	.16	—.07	.99	84
Composite	.23	.14	—.09	1.70	96
Wriggles when sitting					
Three-year-olds	.25	.10	—.15	1.81	96
Four-year-olds	.26	.23	—.03	.38	65
Composite	.28	.18	—.10	1.75	96
Laughs, jumps around excessively					
Three-year-olds	.08	.15	.07	.99	83
Four-year-olds	.23	.23	.00	.00	50
Composite	.13	.21	.08	1.54	93
Picks nose					
Three-year-olds	.13	.08	—.05	.75	77
Four-year-olds	.13	.07	—.06	1.11	86
Composite	.11	.07	—.04	1.00	84
Handles sex organs					
Three-year-olds	.03	.03	.00	.00	50
Four-year-olds	.07	.02	—.05	1.43	93
Composite	.05	.02	—.03	1.11	86
Stutters					
Three-year-olds	.05	.08	.03	.56	71
Four-year-olds	.05	.02	—.03	.94	83
Composite	.05	.04	—.01	.34	64

*See footnotes for Table 1.

**Other behavior studied which might fit under the above heading but which revealed no relation to nursery school attendance included: "chews objects," "twitches," "holds body tense," "fears animals," and "fears noise."

"avoids risk" and "daydreams" verges on significance in the case of the composite groupings. Age differences are too slight to justify discussion, although "fears dark" shows a more definite tendency to decrease for the four year group than for the three year group.

Nervous Tendencies.—The so-called "nervous tendencies" listed in Table 2 are generally thought of as overt signs of inhibition. It will be seen in general that these are less frequent in the nine months group than in the six weeks group. The decrease with nursery school attendance is most apparent for the composite groupings of "twists hair," "tense at rest," "wriggles when sitting," "plays with fingers." Age differences are not outstanding. The slightly greater decrease in "picks nose" and "handles sex organs" for four-year olds than for three-year-olds is interesting (1) since the decrease in these two types of behavior might well be due to social pressure rather than to a relieving of nervous tensions and (2) since social forces are recognizably more potent for four- than for three-year-olds. Nursery school attendance would also seem to reduce stuttering in

TABLE III

RELATION OF NURSERY SCHOOL ATTENDANCE TO ROUTINE BEHAVIOR

Behavior**	Percentage		Difference	Critical Ratio	Chances In 100
	Six Weeks Group*	Nine Months Group*			
Eating					
Refuses food					
Three-year-olds	.28	.10	—.18	2.22	99
Four-year-olds	.18	.14	—.04	.53	71
Composite	.24	.13	—.11	1.90	97
Dawdles					
Three-year-olds	.33	.25	—.08	.79	79
Four-year-olds	.45	.23	—.22	2.20	99
Composite	.43	.25	—.18	2.54	99
Sleeping					
Resists at rest					
Three-year-olds	.22	.10	—.12	1.48	93
Four-year-olds	.24	.22	—.02	.26	60
Composite	.18	.18	.00	.00	50
Stays awake long at nap					
Three-year-olds	.29	.18	—.11	1.11	86
Four-year-olds	.54	.44	—.10	.96	83
Composite	.43	.37	—.06	.82	79
Stays awake during nap					
Three-year-olds	.12	.09	—.03	.41	65
Four-year-olds	.20	.18	—.02	.24	60
Composite	.18	.15	—.03	.53	71
Elimination					
Wets self during day					
Three-year-olds	.08	.03	—.05	1.02	84
Four-year-olds	.04	.00	—.04	1.63	94
Composite	.06	.01	—.05	2.00	98
General Routines					
Wastes time					
Three-year-olds	.18	.28	.10	1.09	86
Four-year-olds	.29	.23	—.06	.76	77
Composite	.25	.24	—.01	.17	56
Leaves tasks incomplete					
Three-year-olds	.28	.30	.02	.20	58
Four-year-olds	.31	.08	—.23	3.34	100
Composite	.28	.19	—.09	1.53	93

*See footnotes for Table 1.

**Other routine characteristics which were studied, but which revealed differences too slight to be included here, were: "regurgitates," "desires to be fed," "awakens crying," "wets self during day."

the case of four-year-olds, but not in the case of three-year-olds. The explanation here seems dubious.

Routine Behavior

Table 3 contains data on those types of routine behavior which seemed to bear some relation to nursery school attendance. The composite groupings indicate that eating problems ("refusing food" and "dawdling"), "enuresis," and "leaving tasks incomplete" seem to decrease with attendance at nursery school. Sleeping habits seem to be least affected by nursery school attendance.

Age seems to have a bearing on the influence which the nursery school exerts in overcoming behavior difficulties during the routine periods. Dawdling of all types, as indicated by "dawdles with food" and "wastes time at routines," decreases more for four-year-olds than for three-year-olds during the nursery school year. In fact, wasting time at routines tends to increase rather than decrease at the three year level. This greater improvement at the four year level may possibly be due to a physical maturing and suggests that our standards for three- and four-year-olds on this type of behavior should not be the same.

"Leaves tasks incomplete" also shows a decrease for four-year-olds as a result of nursery school attendance while there is a slight increase for three-year-olds. Again growth and development may explain the greater benefits of the nursery school at the four year level.

In two instances, "refuses food" and "resists at rest," the influence of the nursery school is more apparent for three- than for four-year-olds. Learning to accept these two situations is on a par with learning to accept new or strange situations in general. It is not surprising that the three-year-old is more adaptable to such changes than the four-year-old, whose habits are already becoming somewhat set. It seems possible to the writer that with further study the nursery school will be found, in general, to be more effective in establishing routine habits for three-year-olds than for four-year-old children, that only in instances where physical maturity is a factor —as in working without dawdling and working without leaving tasks incomplete—will nursery school influences in routine habits be greater for four-year-old children. This raises an interesting query: Would the nursery school be even more successful in establishing routine habits at two than at three years of age? The answer to this question cannot be found in the present data, but it is exceedingly important since it might well serve as one criterion of the age at which children should enter nursery schools.

Other Comparisons Made Between Behavior and Nursery School Attendance

The remaining behavior items studied in relation to nursery school attendance included: "cries easily," "jealousy," "sucks thumb," "awakens crying," "fears animals," "fears noise," "chews objects," "twitches," "holds body tense," "sulks," "grumbles," "has temper outbursts," "breaks toys," "misrepresents facts," "takes property of others secretly," "rushes into danger," "regurgitates food," and "desires to be fed." None of these revealed a significant relation to length of stay in nursery school.

It will be noted that a large proportion of the traits listed above have to do with emotional behavior. This suggests the possibility that the influence of the nursery school may be greater for social behavior and routine adjustments than for emotional traits *per se*.

Although insignificant, there was a tendency, following a year in nursery school, for "cries easily" and for "sucks thumb" to decrease in the three-year-old but not in the four-year-old group. Thumbsucking even tended to increase from fall to spring in the case of the four-year-old children. It seems possible to the writer that these types of behavior may tend to have basically different causes at the three and four year levels. In the younger children they may represent behavior held over from infancy, infantile lack of control. In the older children they may be symptoms of underlying tensions. Our study obviously gives no basis for this assumption. It is merely mentioned as a possibility for further experimentation.

Summary

A group of 106 children with nine months of nursery school experience was compared with a control group (matched for age, sex, race, and economic background) who had had only six weeks of nursery school background.

The study, in general, substantiates other investigations in revealing

1. An improvement in social adjustments following nursery school attendance.

2. A decrease in behavior indicative of inhibitions following nursery school attendance.
3. An improvement in routine habits after nursery school experience

The study has also indicated that the influence of the nursery school is different at different age levels. In compliance with routines, three-year-olds seem to profit more from the nursery school experience, while in techniques of social adjustment and in habits of work the four-year-olds seem to show the greater advance.

Interpretation of the various findings and suggestions for further study are discussed in the body of the report. Obviously, much further experimentation is needed. It is hoped that further investigations will throw additional light on the differential as well as on the general effects of nursery school attendance.[8]

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THE ROLE OF CULTURAL STATUS IN INTELLIGENCE CHANGES OF PRESCHOOL CHILDREN

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That children attending preschool gain in intelligence has been demonstrated by Wellman (4, 5, 6) in three previously published articles. There is in the literature abundant evidence which testifies to a positive relationship between intelligence of children and the cultural status of their parents. It is with respect to the interrelation of these two established facts that the present study has its setting.

The specific purpose of the study was to determine whether children of parents of different cultural status showed any significant differences in changes in intelligence during preschool attendance. Occupational classification of the father and educational level of the parents were selected as indices of cultural status. Stated more specifically in terms of the measures employed, the problem might be formulated in the following questions: Are the specific gains or losses in the intelligence of the preschool children associated with the different occupational classifications of their fathers? Do the preschool children whose fathers are ranked in the highest occupational classifications show greater, less, or similar changes when compared with the preschool children whose fathers are ranked in other occupational classes? If changes in intelligence are differentiated upon the basis of the father's occupation, a further question would seem pertinent, namely: Is there a characteristic amount of change associated with a particular occupational class?

Similar questions might be asked with reference to educational level of parents. Here specific questions include: Are changes in the intelligence of the preschool children associated with the education of their parents? Do children whose parents have a higher education (more years of formal schooling) show greater, less, or similar changes in intelligence during preschool attendance when compared with the children whose parents have less education?

The significance of this research is found in its attempt to analyze further the forces which seem responsible for the changes in intelligence of the preschool children. It was thought that if it were found that occupational classification and gain in intelligence were significantly related, it would be reasonable to assume that the constellation of factors which characterize superior occupational classification functions in a manner contributory to the change. Practically this would mean that if one is to predict the amount of change in intelligence of the preschool child from his initial test, it would be necessary to know the occupational classification of the father. If, on the other hand, measures of cultural status, such as occupational classification, were found not to be significantly related to the gains in intelligence, it would follow that the influence implied in the term cultural status could not be considered as responsible for the changes, and that the various measures of cultural status employed could not be used as a basis for predicting changes.

In the selection of an appropriate measure of cultural status, a choice can be made between a variety of indices all claiming to be fairly valid. Actually, measures of cultural status as employed by various investigators range from the widely used occupational classifications to a unitary criterion. Despite the fact that this variety of measures exists, certain practical considerations restricted the choice of measures to a few.[1] The occupational classification devised by Goodenough (2) was chosen chiefly because it seemed representative of those scales which are modifications of the original Taussig scale and because it had been employed previously as the basis for the classification of the paternal occupa-

[1] For a more detailed discussion of the problems confronted in the selection of measures of cultural status, see Coffey (1).

tions of preschool children. Comparison of mean intelligence quotients of the children in the present study, when classified according to the Goodenough scale and when classified according to the occupational scale prepared by Kefauver, Noll, and Drake (3), did not reveal any significant differences. All of the children fell in the first four occupational classifications. The differences between the four classes of the two schemes ranged from .6 to 2.6 points in IQ. This fact was taken as evidence that the results obtained from the various occupational scales would probably not vary significantly. The categories listed by Goodenough are given in the following tabulation:

Class I—Professional
Class II—Semiprofessional and managerial
Class III—Clerical, skilled trades, and retail business
Class IV—Semiskilled occupations, minor clerical positions, minor business, and farmers
Class V—Slightly skilled trades
Class VI—Day laborers

The other measure of cultural status employed in this study, educational level of the parents (number of years spent in school), is sufficiently clear-cut not to be complicated by the difficulties inherent in a choice of occupational scales.

Subjects

Repeated intelligence tests, together with data concerning occupation of father and education of father and mother, were available for more than 400 children attending the preschool laboratories of the Iowa Child Welfare Research Station from 1921–1922 to 1933–1934.

The intelligence scores were results from the administration of Kuhlmann-Binet and Stanford-Binet tests, the former having been used for the most part up to three and one-half years of age, while the latter was administered to children of older ages. In the earlier years of the testing program, the Stanford Revision was also used for the younger ages. More than twenty persons made the examinations, all of whom were experienced testers, and no attempt was made to assign the same child to a specific examiner for retest. Since the mean IQ's obtained on the first test on the two scales were the same for three-year-old children, the IQ's obtained on the two scales have not been treated separately.

Retests were given at intervals of about six months, with variation of from five to eight months. Fall tests were chiefly tests given in October and November, with a few in September, while spring tests were given chiefly during April and May.

Occupation of Father and Intelligence of Preschool Children

Intelligence of Children on Entering Preschool

In Table 1 is shown the intelligence of the children when they entered preschool, classified according to occupation of father and compared with Goodenough's data on Kuhlmann-Binet tests of 380 children, ages two, three, and four years, selected to be representative of the child population of Minneapolis.

With the exception of Class II, there is little difference between the mean IQ's and the

Table I

Intelligence of Children on Entering Preschool Compared With Goodenough's Group When Classified According to Occupation of Fathers

Occupational Class	Iowa City Children				Goodenough Group		
	Children	Mean IQ	Median IQ	Standard Deviation	Children	Mean IQ	Standard Deviation
I	278	119.4	118.4	16.6	56	116.1	14.6
II	47	110.0	116.5	14.3	29	111.7	14.4
III	57	114.1	114.5	14.1	129	107.7	14.4
IV	35	111.4	110.5	16.3	79	105.3	15.7
V					48	104.3	17.3
VI					39	96.0	14.9
Combined II to IV	139	112.0	111.7	14.9			

median IQ's of each class, despite the fact that there is a relatively small number of cases in Classes II, III, and IV. When Classes II to IV are grouped together, the combined mean and median IQ's are practically the same.

There is a significant difference between the mean IQ of Class I and the mean IQ of Classes II to IV combined, and between the median IQ of Class I and the median IQ of Classes II to IV combined. (The probable error of difference between the mean IQ of Class I and the mean IQ of the combined classes is 1.08; the critical ratio 6.85. The probable error of difference between the median IQ of Class I and the median IQ of the combined classes is 1.35; the critical ratio 4.96.) Thus significant differences in intelligence at the time of entrance to preschool are shown to be associated with occupational class.

The factor of selection is recognized immediately, as the intelligence test scores show that the subjects as a whole are somewhat superior to the general population and somewhat superior to Goodenough's group, with the exception of Class II. This fact, however, does not obscure the relationship which holds between occupational status and intelligence, since even in this selected population differences between the classes still obtain. Evidences of overlapping in mental ability among the four occupational classes similar to those shown in most studies of socio-economic status and intelligence of children were found and are presented in more detail in the fuller report of the study by Coffey (1).

Changes in IQ During First Year of Preschool

Changes in intelligence during the interval between the first fall test and retest the following spring did not reveal any significant differences between the four occupational groups, nor between Class I and Classes II to IV combined. During this interval the 417 children were attending preschool. Mean and median changes in intelligence from fall to spring for each occupational class are presented below:

Occupational Class	Children	Mean Change	Median Change	Standard Deviation
I	278	7.1	6.9	11.6
II	47	5.1	4.2	11.6
III	57	6.1	6.6	11.5
IV	35	7.4	6.3	10.1
Combined II to IV	139	6.1	5.9	11.3

Neither reveals any significant difference. (The probable error of the difference between the mean changes of Class I and the combined lower classes is .80; the critical ratio 1.25. The probable error of difference between the median changes of these two groups is 1.00; the critical ratio 1.00.) Gains for all classes in terms of means were from 5 to 7 points, while in terms of medians these changes were from 4 to almost 7 points.

Changes in IQ Calculated from Any Fall Test

In order that the number of cases in each occupational level might be increased, the mean IQ's and the mean changes in IQ were computed on the basis of any fall test. This procedure meant that fall retests, as well as initial fall tests, were included in the computation and in some cases several different test results of the same child were incorporated. A total of 592 fall tests were included in this calculation, 412 classified in occupational Class I, and 180 classified in the combined Classes II to IV. Table 2 shows the distribution of mean and median IQ and changes

TABLE II

MEAN AND MEDIAN IQ'S AND MEAN AND MEDIAN CHANGES IN IQ FROM FALL TO SPRING WHEN FALL IQ IS BASED ON ANY FALL TEST AND CHILDREN CLASSIFIED ACCORDING TO OCCUPATION OF FATHER

Occupational Class	Children	Mean IQ	Median IQ	Standard Deviation	Mean Change	Median Change	Standard Deviation
I	412	120.2	119.4	16.5	6.0	6.3	11.3
II	68	113.1	112.2	14.5	4.0	3.1	10.7
III	72	115.4	117.5	14.5	6.0	5.6	10.5
IV	40	111.1	113.0	17.0	8.6	7.9	9.9
Combined II to IV	180	113.5	114.8	15.2	5.7	5.4	10.6

in IQ from fall to spring during preschool attendance, when the children were classified according to the occupation of the father.

The same relative places are maintained by the means and medians of the four occupational classes in this distribution as was shown in the distribution based upon initial fall test. In both distributions, the mean and median IQ's of Class II are out of line in terms of a regular progression.

While computing the mean and median IQ's on the basis of any fall test increases the number of cases per occupational group, the cases in Classes II, III, and IV are probably still too few to justify comparisons with these classes separately. The difference in mean IQ's between occupational Class I and the combined lower classes is statistically significant. (The probable error of the difference is .94; the critical ratio 7.0.) In terms of median IQ's, the difference between these two groups is not statistically significant, but approaches a true difference. (The probable error of the difference is 1.37; the critical ratio 3.36.)

Furthermore, neither the mean changes in IQ nor the median changes in IQ from fall to spring differ significantly from the distributions when based upon first fall test. The gain from fall to spring was approximately the same in both distributions.

Changes in IQ According to IQ Level

In an effort to present a clearer picture of the changes in IQ associated with occupational groups, the IQ's were grouped according to various IQ levels and mean changes for each IQ level ascertained. Table 3 shows the mean change from fall to spring when IQ changes are classified according to occupational class and IQ level.

A similar trend of change with IQ level among occupational classes is shown in the table below. The similarity is even more striking when Class I is compared with the combined Classes II to IV. In both groups there is shown the diminution of IQ change with ascendance in the IQ scale, the only exception being a reversal of positions of the 110 to 119 IQ levels and the 120 to 129 IQ levels for the combined classes. The changes vary from 1.1 at the highest IQ level to 17.0 points at the lowest IQ level.

Although the amount of change in IQ for the two occupational groups is similar in each IQ level, for Class I as compared with the combined Classes II to IV, the consistency of greater gain on the part of those children included in Class I might be interpreted as indicating a slight difference between the groups, but at no IQ level is this difference found to be statistically significant, and at the 90 to 109 level the advantage is reversed. At one IQ level, 110 to 119, the difference in amount of change, 4.6 points, approached a true difference. (The probable error of difference is 1.22, with a critical ratio of 3.77.) At the 120–129 IQ level, the probable error of the difference was 1.12, with a critical ratio of 1.48.

Chiefly in order to augment the number of cases for comparison, the mean IQ's and mean changes from fall to spring were grouped into two larger divisions, fall IQ's below 115 and fall IQ's of 115 and above, at the same time maintaining occupational differentiation. Changes from fall to spring computed for both of these divisions are shown in Table 4.

TABLE III

MEAN CHANGES IN IQ FROM FALL TO SPRING ACCORDING TO INITIAL IQ LEVEL AND OCCUPATIONAL CLASSIFICATION OF FATHER

Occupational Class	IQ Level 89 and Below		90 to 109		110 to 119		120 to 129		130 and Above	
	Children	Change	Children	Change	Children	Change	Children	Change	Children	Change
I	11	17.0	101	9.0	100	7.5	82	5.8	118	1.7
II	3	16.3	26	7.2	21	1.2	11	4.3	7	—3.1
III	3	14.0	19	12.5	21	3.0	18	3.0	11	.4
IV	3	9.3	15	9.4	7	7.9	9	6.6	6	7.5
Combined II to IV	9	13.2	60	9.5	49	2.9	38	4.2	24	1.1

TABLE IV

MEAN IQ'S AND MEAN CHANGES FROM FALL TO SPRING ACCORDING TO OCCUPATIONAL CLASSES WHEN FALL IQ'S ARE GROUPED INTO DIVISIONS, 114 IQ AND BELOW AND 115 IQ AND ABOVE

Occupational Class	Children	Mean IQ	Mean Change
	114 IQ and Below		
I	162	104.6	9.2
II	37	103.0	6.4
III	30	101.9	11.0
IV	23	98.6	9.6
Combined II to IV	90	101.6	8.7
	115 IQ and Above		
I	250	130.0	4.3
II	31	125.6	1.6
III	42	125.0	1.7
IV	17	127.8	6.0
Combined II to IV	89	125.7	2.6

Here again the tendency for greater gain in IQ in the lower levels of IQ and the diminution of gain in the higher levels is shown for all occupational levels. In the division 114 and below, the difference in gain between Class I and the combined Classes II to IV is .5 point. In the division 115 and above, the difference is 1.7 points (the probable error of the difference is .87, with a critical ratio of 1.96).

Thus from these data it is reasonably safe to conclude that there are not significant differences in change in IQ associated with occupational classification of the fathers of preschool children during the attendance of these children in the preschools of the Iowa Child Welfare Research Station. There is an indication that children whose fathers are classified in occupational Class I make slightly greater gains than those whose fathers are classified in the other groups, but this tendency, while appearing at several IQ levels, is nowhere found to be statistically significant.

Changes in IQ When Not in Preschool

To ascertain whether there was any difference in children of the various occupational levels in changes in IQ during the summer months when not in preschool, the IQ's of 317 spring tests were classified according to occupational level and mean IQ's and mean changes to fall computed for each group, as shown in the following tabulation:

Occupational Class	Children	Mean Change	Standard Deviation of Change
I	226	— .62	12.5
II	42	1.71	11.4
III	31	0.00	11.7
IV	18	— .05	6.0
Combined II and IV	91	.30	10.6

The interval between tests was approximately the same as between fall and spring tests.

These data yield additional evidence that, with children attending the preschools of the Iowa Child Welfare Research Station, changes in IQ are not associated with particular occupational levels. From this tabulation it is evident that there is no apparent difference between mean changes in IQ during the spring to fall interval; in each class there is a failure to gain. The greatest difference found is between occupational Class I and Class II, but this difference, 2.3 points, is not statistically significant. (The probable error of difference is 1.75; the critical ratio of the difference 1.3.) Moreover, this study coincides with previous findings in showing that there is failure to gain in IQ during the average six-month interval of nonattendance between spring and fall tests by children who have gained while attending preschool during the fall to spring terms.

Sex Differences and Changes in IQ

The question as to whether there are sex differences in changes in IQ and whether these differences, were any found, are associated with occupational classification seemed to be pertinent to this study. Two comparisons were made: first, a comparison of the amount of changes of boys and girls in the interval of preschool attendance from fall to spring, and secondly, a comparison of boys and girls in the changes during the interval of nonattendance from spring to fall. Table 5 gives a summary of the mean IQ and changes in IQ from fall to spring for boys and girls within occupational classes.

Consistent with most of the data on sex differences in intelligence at these ages, the comparisons reveal that the girls are somewhat higher than the boys in mean IQ in each occupational class. In Class I this sex difference approaches a true difference. (The probable error of the difference is 1.08; the

TABLE V

MEAN IQ'S AND MEAN CHANGES IN IQ FROM FALL TO SPRING ACCORDING TO OCCUPATIONAL CLASSES WHEN SEPARATED AS TO SEXES

Occupational Class	Children	Mean IQ	Standard Deviation	IQ Change	Standard Deviation
		Boys			
I	219	118.2	17.3	6.2	11.4
II	33	109.0	13.8	4.5	10.2
III	35	115.0	12.7	5.5	9.5
IV	20	108.8	15.6	5.0	8.6
Combined II to IV	88	111.5	14.9	4.9	9.6
		Girls			
I	193	122.5	15.4	6.0	10.7
II	35	117.0	14.1	4.0	10.9
III	37	115.5	14.5	5.7	11.6
IV	20	114.5	17.5	11.8	9.7
Combined II to IV	92	115.8	15.0	5.7	11.3

critical ratio 3.9.) A true difference exists between the mean IQ's of boys in Class I and the mean IQ's of boys in the combined Classes II to IV (The probable error of the difference is 1.30; the critical ratio 5.1.) and between the mean IQ's of girls in Class I and girls in the combined classes (The probable error of the difference is 1.29; the critical ratio 5.2.).

Despite differences in mean IQ associated with occupational class for both boys and girls, and despite the differences between the sexes within the occupational class itself, there is no significant difference in the mean change in IQ from fall to spring. On the basis of these comparisons, it may be stated that with this population there is no difference between girls and boys of the same occupational class, or of different occupational classes, in the amount of change in IQ during preschool attendance.

A similar comparison was made when mean IQ's were computed from the spring test and the change in IQ calculated over a period of nonattendance from spring to fall. Although the number of cases was too few to make comparisons between separate occupational groups feasible, boys and girls in Class I were compared with boys and girls in Classes II to IV combined. The following tabulation gives a summary of the mean IQ's and changes from spring to fall when these have been separated according to both occupational level and sex.

Occupational Class	Children	Mean IQ	Standard Deviation	Mean IQ Change	Standard Deviation
		Boys			
I	119	124.8	16.2	.1	12.5
Combined II to IV	42	112.9	12.7	1.4	11.1
		Girls			
I	107	127.9	17.7	—1.6	12.1
Combined II to IV	49	122.3	13.9	— .7	9.0

Girls in Class I were again shown to be somewhat higher than boys in Class I in intelligence on the basis of the spring test, although this difference was not significant. Girls were found to be significantly higher than boys in the combined classes. (The probable error is 1.88; the critical ratio 5.0.) The difference between the boys in Class I and the boys in the combined classes was found to be statistically significant (The probable error of the difference is 1.66; the critical ratio 7.2) and although the difference between the girls in Class I and in the combined classes was not satistically significant, it approached a true difference (The probable error of the difference is 1.77; the critical ratio 3.4). Hence, it is evident that the relationship between the sexes is practically the same in this comparison as it was in the fall to spring comparison.

Failure to gain over the period of nonattendance was common to all occupational

classes and to both boys and girls within these classes, as will be seen from the summary of mean changes contained in the above tabulation. It can be safely said that there is no difference between the sexes of the different occupational levels in mean change from spring to fall, all groups failing to gain during this period of nonattendance.

Age Differences and Changes in IQ

In an attempt to ascertain whether the changes in IQ were related to age, the children were classified according to age level within an occupational class, and the mean change in IQ calculated for each age level. The age levels were separated into four divisions: two years (18 to 29 months), three years (30 to 41 months), four years (42 to 53 months), and five years (54 to 65 months). The total number of cases in this comparison was somewhat less than the other comparisons because of the fact that some of the children fell in the six-year division, although there were not enough in this division with which to make separate comparisons.

Table 6 presents a summary of the mean IQ's and mean changes from fall to spring when the IQ's of each occupational class have been divided into age divisions.

A total of 401 cases were included in occupational Class I and 172 in the combined group. The means all center around 120 to 123 in Class I, while the mean changes range from 5 to 7 points. In the combined classes there is greater variation in mean IQ between the age levels than was apparent in Class I. Although the mean IQ and mean change at the two-year level seem at variance from the other means of this occupational group, the cases were too few to warrant reliable comparisons. The four-year level of the combined classes was found to be significantly lower in mean IQ than the five-year level. (The probable error of the difference is 1.75; critical ratio 4.00.) The difference between the four-year level and the three-year level of the combined classes approached a true difference (The probable error of the difference is 2.00; critical ratio 3.00.) There appears no ready explanation for the lower IQ of the four-year-olds.

At the two older age levels, Class I was significantly higher in mean IQ than the combined classes, while at the three-year level the difference approached a true difference. (At the four-year level the probable error of the difference is 1.66, with a critical ratio of 8.4; at the five-year level, the probable error of the difference is 1.46, with a critical ratio of 4.10; at the three-year level, the probable error of the difference is 1.9, with a critical ratio of 3.10.)

Despite the fact that there were these significant differences between the mean IQ's of the occupational classes, at no age level was there a significant difference between amounts of change in IQ during the period from fall to spring, either when the two occupational classes were compared or when age levels within the same occupational class were compared. The three-year-old children of Class I gained 2.7 points more than the four-year-olds of Class I. (The probable error of the difference is 1.15 and the critical ratio 2.4.) The four-year-olds of the combined classes gained 4.0 points more than the five-year-olds

TABLE VI

MEAN IQ'S AND MEAN CHANGE IN IQ FROM FALL TO SPRING WHEN OCCUPATIONAL CLASSES HAVE BEEN DIVIDED INTO AGE DIVISIONS

Age, Years	Children	Mean IQ	Standard Deviation	IQ Change	Standard Deviation
		Class I			
2	41	120.9	17.3	5.8	13.2
3	101	121.5	10.9	7.5	13.5
4	116	123.4	17.3	4.8	11.4
5	143	121.6	14.6	5.3	8.6
		Combined Classes II to IV			
2	7	121.7	10.8	11.6	15.7
3	32	115.0	13.0	6.5	12.2
4	55	109.0	14.0	7.7	11.4
5	78	116.0	14.4	3.7	8.3

of the combined classes. (The probable error of the difference is 1.49 and the critical ratio 2.7.) The four-year-olds of the combined classes gained 2.9 points more than the four-year-olds of Class I. (The probable error of the difference is 1.26 and the critical ratio 2.3.) The five-year-olds of Class I gained 1.6 points more than the five-year-olds of the combined classes. (The probable error of difference is .80 and the critical ratio 2.0.)

Table 7 presents a summary of the mean IQ's and mean changes in IQ of the different age levels of the two main occupational categories when IQ's have been based upon the period of nonattendance from spring to fall was common to both occupational groups and to the different age levels within the occupational classes.

Changes in IQ Over a Two-Year Period

Since no differences in amount of change were evident between occupational classes when changes in IQ were calculated for the short intervals from fall to spring and spring to fall, it was thought pertinent to the general question to analyze changes in IQ over a two-year period with the objective of ascertaining whether in this extended period differences

TABLE VII

MEAN IQ'S AND MEAN CHANGES IN IQ FROM SPRING TO FALL WHEN OCCUPATIONAL CLASSES HAVE BEEN DIVIDED ACCORDING TO AGE

Age, Years	Children	Mean IQ	Standard Deviation	IQ Change	Standard Deviation
		Class I			
2	12	120.2		4.8	
3	74	129.4	16.5	—2.6	15.2
4	84	127.6	18.0	— .6	12.8
5	52	124.2	14.8	—1.5	8.7
		Combined Classes II to IV			
3	20	120.7	16.0	—2.9	11.5
4	29	118.3	14.5	— .8	12.7
5	24	118.1	13.3	— .8	7.2

the spring test and the changes have been calculated over the period of nonattendance from spring to fall.

Occupational Class I in this comparison comprised a total of 222 cases and there were seventy-three in the combined Classes II to IV. The difference between the mean IQ's of the occupational classes was significant at only one age level, the four-year age group. (At the four-year level, the probable error of the difference is 2.24, with a critical ratio of 4.2; at the three-year level, the probable error of the difference is 2.29, with a critical ratio of 2.7.) The differences in the mean IQ's at the different ages within the same occupational class were found not to be statistically significant in either occupational Class I or occupational Classes II to IV combined.

The mean changes from spring to fall were approximately the same for all age levels and for both occupational classes, ranging from —.8 to —2.9 points. Failure to gain during

between the two occupational groups would be revealed. The extended period allowed for two periods of preschool attendance with an intervening summer when the children did not attend preschool, except in the case of a few children for a brief session of six weeks immediately following the close of the spring term. The gains from the fall test to the second spring test for the group as a whole are somewhat greater than the gain during one fall to spring preschool period.

Since the number of children in the combined occupational Classes II to IV who had attended preschool for two successive years was few, it was decided to match the two occupational divisions on the basis of initial IQ and compute the changes in IQ over the two-year period from these matched groups. Thirty-five children of the combined occupational classes were matched with thirty-five children of Class I in fall IQ's, and changes in IQ over a two-year period were computed. In all but four cases, the IQ's of pairs were

identical and in these four exceptions the difference was one point. Where there were several identical IQ's in Class I, selection of the one to be used was made alphabetically.

The following tabulation gives the mean changes in IQ over the two-year period for the two occupational groups matched in IQ.

Occupational Class	Children	Mean IQ	Mean Change	Standard Deviation
I	35	112.8	9.1	13.5
Combined II and IV	35	112.8	8.5	12.2

There is practically no difference between the two occupational divisions in mean change over the two-year period, both gaining approximately 9 points.

Summary on Occupational Classification

From this investigation of the relation between occupational classification of father and the changes in IQ of more than 400 children attending the preschools of the Iowa Child Welfare Research Station, the following facts are evident:

1. Although the children entered preschool with IQ's significantly varying according to occupational classification of father, during a subsequent six-month period of preschool attendance all occupational groups gained in IQ in approximately equal amounts (on the average about 5 to 7 points).
2. During a six-month period of nonattendance all occupational groups failed to change in any significant manner (on the average less than one point).
3. Within each occupational group the amount of gain was related to the IQ level of the children on entering preschool, those with the lowest initial intelligence gaining most and those with the highest initial intelligence gaining least (gains varying up to 17 points on the average). Children of a given IQ level made a given amount of gain regardless of their occupational classification.
4. There were no sex differences in amount of gain of occupational classes during a six-month period of preschool attendance. Both boys and girls of each occupational class failed to gain over a six-month period of nonattendance.
5. There were no age differences in amount of gain of occupational classes during a six-month period of preschool attendance. Every age level failed to gain during a six-month period of nonattendance.
6. There were no differences between two occupational divisions (professional and nonprofessional) in amount of change over a two-year period of preschool attendance, both groups making somewhat greater gains than were made during the six-month period (on the average about 9 points).

Education of Parents and Changes in Intelligence of Preschool Children

Fathers' and Mothers' Education and Changes in IQ

Since the educational level of the parents is commonly regarded as an indication of cultural status, in addition to the occupational classification of the father, it was chosen as another measure for analysis in this study. The question which seemed pertinent in this connection was: Are different levels of parental education associated with different changes in intelligence in preschool children?

Educational level was determined by the number of years a parent had spent in an educational institution such as public schools, high schools, colleges, and universities. Three groups differing in educational level were compared: (1) 8 to 11 years, (2) 12 to 15 years, and (3) 16 to 20 years. The first group represents grammar school and high school education where there was failure to complete the high school course. Education in the second level means graduation from high school and attendance at college, but not completion of the college course. Education in the third group represents graduation from college and further time spent in higher education. In addition to these three main educational levels, the years 16, 17, and 18 to 20 were treated separately since a large number of cases was found within these groups.

Table 8 shows the mean IQ's and the mean changes from fall to spring for children whose parents were classified in each of these groups.

Although there was an increase in the means with higher educational level of parents, there were only two comparisons where significant differences in mean IQ's were found between adjacent educational levels.

TABLE VIII

MEAN IQ'S AND MEAN IQ CHANGES FROM FALL TO SPRING OF CHILDREN CLASSIFIED ACCORDING TO FATHERS' EDUCATION AND MOTHERS' EDUCATION

Years of Education	Children	Mean IQ	Standard Deviation	IQ Change	Standard Deviation
		Fathers' Education			
8 to 11	16	106.4	12.5	7.6	10.7
12 to 15	114	116.9	15.0	6.0	9.8
16 to 20	347	119.6	16.9	6.5	11.1
16	86	115.9	17.6	7.1	10.1
17	48	117.9	16.8	6.0	9.9
18 to 20	213	121.4	16.3	6.3	11.2
		Mothers' Education			
8 to 11	10	103.0	12.1	5.4	5.1
12 to 15	214	117.8	16.8	7.1	10.8
16 to 20	253	119.7	16.3	5.9	10.6
16	209	118.9	16.2	6.3	9.4
17	32	122.7	15.5	2.6	14.2
18	12	125.8	19.5	8.5	10.8

Children whose fathers and mothers were in educational levels 12 to 15 years had significantly higher IQ's than children whose fathers and mothers were in educational level 8 to 11 years. (The probable error of the differences for fathers is 2.3, with a critical ratio of 4.6; the probable error of the difference for mothers is 2.7, with a critical ratio of 5.5.) The difference between the children whose fathers had 18 to 20 years of education and those whose fathers had 16 years of education approached a true difference (the probable error of the difference is 1.48, with a critical ratio of 3.7). None of the other adjacent levels was found to be significantly different. Children whose fathers had a given level of education did not differ significantly in mean IQ from those whose mothers were of the same level.

Mean changes from fall to spring were found not to differ significantly with educational level. Preschool children whose fathers and mothers were of higher educational levels did not differ in gains from fall to spring from those whose fathers and mothers were of a lower educational level. Children whose fathers were of a given educational level did not differ in mean change in IQ from those whose mothers were of the same level.

Midparent Education and Changes in IQ

Because there were in many cases great variations in the education of the two parents, an average of the father's and mother's education was computed which was termed the midparent education. A total of 464 preschool children were classified according to the education of the midparent and grouped into the three educational levels, 8 to 11 years, 12 to 15 years, and 16 to 20 years. Table 9 gives a summary of the mean IQ's and mean changes in IQ from fall to spring when these were classified according to midparent education.

TABLE IX

MEAN IQ'S AND MEAN CHANGES FROM FALL TO SPRING OF 464 PRESCHOOL CHILDREN CLASSIFIED ACCORDING TO MIDPARENT EDUCATION

Midparent Education, Years	Children	Mean IQ	Standard Deviation	IQ Change	Standard Deviation
8 to 11	20	105.4	13.0	6.9	14.9
12 to 15	181	115.8	15.3	6.8	10.4
16 to 20	263	121.2	16.6	5.8	11.0
16	111	121.7	17.4	6.2	10.4
17	102	120.3	15.2	6.5	10.4
18 to 20	50	122.0	18.0	3.8	12.3

Considerable differences are shown in Table 9 in the mean IQ's of preschool children of different midparent educational levels, the better educated parents having children of higher IQ. The differences between the mean IQ's of the three main levels are statistically significant in each instance (at 8 to 11 years and 12 to 15 years, the probable error is 2.1, with a critical ratio of 5.2; at 12 to 15 and 16 to 20 years, the probable error of the difference is 1.02, with a critical ratio of 4.9; at 16 to 20 and 8 to 11 years, the probable error of the difference is 2.07, with a critical ratio of 7.7). The mean IQ's of the 16, 17, and 18 to 20 year levels considered separately did not differ significantly, all being 120 to 122.

In spite of the differences between the mean IQ's of children of the three midparent educational levels, there was no significant difference between the mean changes in IQ from fall to spring. The gains for the three groups were 5.8, 6.8, and 6.9 points.

The 464 preschool children classified according to the midparent education were separated as to sexes, and the differences in mean IQ and mean change in IQ from fall to spring ascertained. The following tabulation presents the mean IQ's and mean changes for these comparisons.

Sex	Children	Mean IQ	Standard Deviation	IQ Change	Standard Deviation
Midparent Education 8 to 15 Years					
Boys	92	112.6	16.5	6.8	10.9
Girls	109	116.5	14.9	6.7	10.1
Midparent Education 16 to 20 Years					
Boys	139	119.1	15.4	6.5	10.8
Girls	124	123.6	15.6	5.1	10.9

In this comparison the twenty cases included in the division 8 to 11 years were combined with the 12 to 15 year group, making a total of 201 children in the 8 to 15 year group. In the group whose midparent education was 16 to 20 years, there were 263 children.

In the group whose midparent education was from 8 to 15 years, the difference between boys and girls in mean IQ was not significant (the probable error of the difference is 1.49; the critical ratio 2.7). In the group whose midparent education was 16 to 20 years, the difference between boys and girls in mean IQ closely approached a true difference (the probable error is 1.28; the critical ratio 3.9). The difference between mean IQ's of boys in the two classes of midparent education was found to be statistically significant (the probable error of the difference is 1.44; the critical ratio 4.2), as was also the difference in mean IQ's of the girls in the two classes of midparent education (the probable error of the difference is 1.3; the critical ratio 5.4).

Despite the fact that the mean IQ's of each sex differed with midparent educational levels, the differences in mean change from fall to spring were not significant. Boys gained 6.5 and 6.8 points and girls gained 5.1 and 6.7 points respectively during this period of preschool attendance.

Summary on Education of Parents

Preschool children were classified according to the educational level of their parents in an effort to determine whether there was any relationship between the educational level of parents and the changes in intelligence from fall to spring during attendance at preschool. Several analyses were made using education of father, education of mother, midparent education, and sex differences as points of comparison. The following conclusions may be stated from the results of the analyses in this section:

1. Upon entering preschool the intelligence of children varied in accordance with number of years of formal education of their fathers and mothers. Parents with more years of education enrolled children with higher IQ's and parents with less education enrolled children with lower IQ's.
2. During a six months' period of preschool attendance all groups of children gained, the gain being approximately the same (about 5 to 8 points) for children whose fathers and mothers were of different levels of education.
3. Upon entering preschool, boys whose parents had more years of formal education were higher in IQ than boys whose parents had less education. Girls whose parents had more years of education were also higher in IQ than girls whose parents were less well educated. But sex differences and educational level of parents did not account for the gains made during a six-month period of preschool attendance, since gains of approximately equal amount (about 5 to 7 points) were made by all groups.

Conclusions

This study investigated the role of cultural status in relation to the changes in intelligence of more than 400 children attending the preschools of the Iowa Child Welfare Research Station. The two measures indicative of cultural status selected for this study were: (1) occupational classification of the father, using the Goodenough classification, and (2) education of the parents.

Several different analyses were made in sections dealing with occupational classification as well as with education of the parents. Specific results of these analyses are found in the summary of each section.

In general, these findings indicate that cultural status, as measured by occupation of father and educational level of the parents, while related to the intelligence of the children on entering preschool, was not a significant factor in the changes in intelligence of children while attending the preschools. For in no comparison was there a significant difference in the changes, either between occupational groups or between educational groups. It may be stated, however, that occupational Class I showed a very slight but consistently greater gain than occupational Classes II to IV combined; yet this was nowhere statistically significant. The amount of gain made was contingent upon the intelligence level attained when the child began his preschool career, irrespective of his cultural status.

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A STUDY OF THE ACHIEVEMENT OF SIXTY GRADE I REPEATERS AS COMPARED WITH THAT OF NON-REPEATERS OF THE SAME MENTAL AGE

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This study is not concerned with the confirmed repeater, for the chronic repeater is a maladjusted individual in need of clinical study and highly specialized treatment. The school system that produces many such individuals has need to question its value to the community which it purports to serve. The present study is an attempt to determine what a child who has not yet formed the habit of failure accomplishes when forced to repeat a grade. As I have said elsewhere, it seems to me that psychology, like biology, should attempt to study any given phenomenon in the simplest form in which it can be observed.

With this viewpoint in mind, the subjects selected for this investigation were sixty Grade I repeaters of a small public school system, for whom Kuhlmann–Binet ratings and Haggerty Reading Examination, Sigma I, comprehension scores were available. Of these, eighteen subjects were in a small homogeneous group. They worked hard, accomplishing what they could the first year, under an excellent teacher. The next year they were given a new teacher and were permitted to go on from the point at which they had left off the previous June. They were repeaters, then, only in the sense that they were conscious of being retained in Grade I for a second year, while the other children who began first grade work at the same time were promoted to Grade II. Another group was admitted at the age of five years to a "primary" class in which Grade I work was undertaken, and was promoted at the end of the year to the "first grade" class on the opposite side of the room. Here, too, work was continued the repeating year from the point at which it had been left off the previous June. As this spending of two years on Grade I work was an established custom in this district, there could be no feeling of failure attached to the experience. The remaining twenty-nine subjects were repeaters in the ordinary sense of the term. That is, in the estimation of their teachers, they had fallen so far behind the rest of their respective groups as to make it advisable for them to do the work of the grade again from the beginning.

Intelligence quotients for the sixty subjects range from 56 to 117, with a median of 84. Some of these children entered Grade I directly from non-English-speaking homes. It is probable that the majority came from such homes, but many learned a surprising amount of English during a year in kindergarten. The language situation, however, was equally true of the nonrepeaters with whom our repeating group is compared. It should be noted that slowness in assimilating English seemed in many cases to be a symptom of dullness rather than the primary cause of school retardation.

In the accompanying tabulation the achievement at the end of the school year of these sixty repeaters, as measured by the Haggerty Primary Reading Test, is compared with that of 418 nonrepeaters of the same Kuhlmann–Binet age. The first column gives the mental age grouping by half years from 5.0 to 8.5, inclusive. In the second column is given the number of nonrepeaters at each mental age level. In the third column is given

Kuhlmann–Binet Mental Age	Nonrepeaters No.	Nonrepeaters Mean Score*	Repeaters No.	Repeaters Mean Score*
5.0 to 5.4	45	1.4	4	2.5
5.5 to 5.9	116	3.3	15	3.3
6.0 to 6.4	132	5.2	21	5.5
6.5 to 6.9	85	9.0	11	6.8
7.0 to 7.4	32	10.2	6	9.1
7.5 to 7.9	7	13.3	2	7.5
8.0 to 8.4	1	17.0	1	12.0
Total	418		60	

* The standard norm is 4 for the end of Grade I, and 12 for the end of Grade II.

the mean achievement on the Haggerty Primary Reading Test in crude score units for each mental age group of nonrepeaters. The fourth column gives the number of repeaters at each mental age level. The fifth column shows the mean score on the Haggerty Primary Reading Test of each mental age group of repeaters.

From this we see that neither repeaters nor nonrepeaters attempting Grade I work with a mental age of less than 6.0 years show a mean score that reaches the norm for the end of Grade I. On the scale used, this norm is 4.0.

The groups beginning the repeating year with a mental age of less than 6.5 did as good work, as measured by this test, as the nonrepeaters of the same mental ages. These were made up largely of the pupils in the two classes that were expected to take two years to complete the work of the grade. Although these children did not benefit by the extra year of teaching, there is nothing in their scores to indicate that they were harmed by it.

The groups with a mental age of 6.5 to 8.5, inclusive at the beginning of the repeating year, all fail to measure up to the means for the nonrepeaters of their respective mental ages. For these twenty individuals, either the repeating experience itself was unfortunate, or the factors which were responsible for their retention had not been eliminated before the work of the grade had been begun for the second time. Some of the nonintellectual factors which contributed to their failure are cited in a brief description of twelve cases that failed markedly to measure up to the standards for their mental age at the end of the repeating year.

Case 1: Mental age 8 2/8, IQ 114, reading score 12. He is here compared with only one child of the nonrepeating group. This comparison in itself, therefore, is without significance. It is significant, however, that a child as bright as this should have had to fail.

Case 2: Mental age 7⅞, IQ 117. He makes a score of 12 as compared with a mean score of 13.3 for seven nonrepeaters of the same mental age group. Again, the difference between his score and that of the small group of nonrepeaters with which he is compared is of less significance than the fact that he failed.

Case 3: Mental age 7⅝, IQ 108, reading score 3. This child had failed of promotion the previous year in another school system. Her repeating year was spent in the same class with an attractive younger sister with whom she was subjected to unfavorable comparison. At the end of her repeating year she still failed to reach the norm for the end of Grade I, in spite of the fact that nonrepeaters of the same mental age exceed the norm for the end of Grade II. Of such are made chronic repeaters unless some teacher is interested enough to build up adequate work habits and establish the habit of success.

Case 4: Mental age 7.0, IQ 92, reading score 3. This boy suffered from a visual defect that remained uncorrected until the middle of his first year in Grade I. During this period of imperfect vision, faulty work habits were built up that remained uncorrected and continued to handicap him throughout his repeating year. This boy at the end of his repeating year still failed to reach the norm for the end of Grade I, while nonrepeaters of the same mental age almost reach the norm for the end of Grade II.

Case 5: Mental age 6 4/8, IQ 81, reading score 3. This child had been one of the eldest children in his kindergarten group. Motor control was good, and he had been regarded as "very bright" by the kindergarten teacher. As a result of this overestimation of his ability, he was placed in a brighter Grade I group than was justified by his mental age. He found himself among the poorest of the group in Grade I activities, in contrast with his position of leader in kindergarten. Effort became poorer and poorer. During his repeating year he became a distinct behavior problem. Poor physical condition probably contributed to his continued failure during the repeating year.

Case 6: Mental age 6⅝, IQ 91, reading score 4. Although he reached the norm for the end of Grade I by the end of his repeating year, this boy made next to the lowest score of the eleven in his mental age group of repeaters. He came of a family in which school failure was a tradition, in spite of adequate ability. His physical condition was good, and attendance regular. He presented no other problem than complete lack of interest in the school situation.

Case 7: Mental age 6 2/8, IQ 84, reading score 0. This child had spent her first year and part of her repeating year in Grade

I in another school system. She gave evidence of possessing a specific reading disability that needed to be met by teaching especially adapted to it.

Case 8: Mental age 6 2/8, IQ 83, reading score 0. This boy had spent his first year in Grade I in another school system. His physical condition was poor, attendance was poor, and the elder children of the family had a history of failure.

Case 9: Mental age 5⅝, IQ 69, reading score 2. This boy began his third year in Grade I with a mental age of 6.3 years. By the end of that year he succeeded in accomplishing the work of the grade.

Case 10: Mental age 5⅝, IQ 71, reading score 1. In addition to poor intelligence, this boy was handicapped by poor physical endowment.

Case 11: Mental age 5⅜, IQ 72, reading score 0. This boy remained "foreign" in language, behavior, and attitudes, although his younger sisters learned English rapidly and made a satisfactory school adjustment.

Case 12: Mental age 5⅜, IQ 56, reading score 2. This girl was of obviously low intelligence. She was a wretchedly poor physical specimen and still hopelessly foreign and unadjusted even at the end of two years of school experience.

If we compare the achievement of each mental age group of repeaters with that of nonrepeaters of the same mental age and combine the results, we find that our sixty repeaters achieve 99.3 as much as nonrepeaters of the same general ability. This per cent should not be regarded as an exact numerical value, as we have no assurance that the raw scores on this reading test are made up of comparable units. We are probably justified, however, in regarding the results of this study as indicating certain general trends.

Of the subjects for whom data were obtained, only one with an IQ below 75 reached the mean achievement for her mental age. This one exception was a stout little girl with an IQ of 74. She had excellent work habits and unusually good retentiveness. When the teacher recommended her for promotion, the Binet rating was verified by a retest.

It may be of interest to note that of the sixty repeaters, nineteen were girls and forty-one were boys.

From the above data it appears that the average repeater of the group studied learned no more in two years than did the average nonrepeater of the same mental age in one year. This suggests a question as to whether it would not have been wiser to postpone the teaching of reading until the individual was mature enough intellectually to profit by it, and in the meantime to direct classroom effort toward the enlarging of experience and the building of vocabularies. Relieved of the necessity of teaching reading to the children too immature to make normal progress, the teacher might have had time to meet the problems of those children who were failing from other causes than lack of intelligence.

THE DULL CHILD AND THE JUNIOR HIGH SCHOOL CURRICULUM*

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PURPOSE OF THE STUDY

The purpose of this study is twofold: (1) to discover how the dull child adjusts to the junior high school curriculum and (2) to discover how the dull child adjusts in his life after the junior high school.

METHOD

To gain evidence regarding the adjustment of the dull child within the junior high school, academic achievement, nonacademic achievement, and social and civic participation within the school were studied. To discover how dull children adjust after they leave the junior high school, data were gathered with respect to schooling beyond the junior high school, work experience, marriage, and delinquency.

To establish criteria for the adjustment of dull children, the same types of materials were collected for average children and these formed the basis on which the judgment of the adjustments of the dull children was made.

DEFINITION OF TERMS

Dullness and Normality

Dullness in this study was represented by an EQ below 85 and normality was represented by an EQ of between 95 and 105. EQ was employed instead of IQ because the investigation had to do in part with school achievement. It is safe to assume that if a group intelligence test had been given to both the dull and the average children, they would still have fallen within the range of dullness and normality as defined in this study since both Kelley[1] and McCall[2] declare that the correlations between EQ and IQ are very high.

An EQ of below 85 was decided upon for dullness and an EQ of between 95 and 105 for normality in order that in the original selection of the groups there might be practically no overlapping between dullness and normality or between normality and brightness.

Junior High School

The criteria for selecting a typical junior high school were culled from Spaulding and Koos in their "Reorganization of Secondary Education."[3] As a result of their investigations, the authors cite 112 practices that are typical of junior high schools in so far as practices may be said to be typical of this branch of the school system.

The Fair Haven Junior High School in New Haven, Connecticut was the school in which the present study was made. It may be regarded as a typical junior high school since it incorporates, either wholly or in part, in its administration and teaching 76 per cent of the practices that would be found in a typical junior high school according to the authors heretofore mentioned.

SCHOOL ADJUSTMENT

Selection of Groups

Three groups of dull pupils (EQ below 85) were selected at random from all the dull pupils in Grade VII, Grade VIII, and Grade IX taking the commercial course. A fourth group was composed of all the dull pupils in Grade IX, taking the technical arts course. Four groups of average pupils (EQ from 95 to 105) were also chosen. These were selected at random from all the average pupils in Grade VII, Grade VIII, and Grade IX, commercial course and Grade IX, technical arts course. The selection of these pupils was based on EQ scores made on achievement tests given to all children in the sixth and eighth grades in the New Haven schools in

* Abstract of a dissertation presented to the faculty of the Graduate School of Yale University in candidacy for the degree of Doctor of Philosophy.

[1] Kelley, Truman Lee: *Interpretation of Educational Measurements.* Yonkers-on-Hudson, N. Y.: World Book, [c. 1927] Pp. xiii, 363. (p. 18; 21)

[2] McCall, William A.: *How to Measure in Education.* New York: Macmillan, 1922. Pp. xii, 416. (p. 40–41)

[3] Spaulding, Francis T., and Koos, Leonard V.: "The Reorganization of Secondary Education (In Three Parts)." [In] *National Survey of Secondary Education.* Dept. of Interior, Office of Educ. Bull., 1932, No. 17 (Monograph No. 5), Pp. xii, 423 (Part III, "Special Reorganizations of School Systems," p. 368–415.)

either March, 1934 or March, 1935. The Stanford Achievement Test, Form W, was given to these eight groups in December, 1935 in order to make a check on the normality or dullness of the various groups. The tabulation shows the results of the random samplings.

Grade	Dull Number	Dull Mean EQ*	Average Number	Average Mean EQ*
VII	39	80	39	100
VIII	39	78	39	99
IX, Commercial	39	81	39	100
IX, Technical Arts	18	81	33	100
All	135	80	150	99.8

* Mean of two achievement tests.

To establish further the dullness or normality of the groups, mean subject quotients, computed from the individual tests of the two achievement batteries, were found for each pupil in the four academic subjects: English, mathematics, social studies, and science. The results of the subject quotients are presented below:

Grade	English Dull	English Average	Mathematics Dull	Mathematics Average	Social Studies Dull	Social Studies Average	Science Dull	Science Average
VII	80	101	84	100	79	100	81	102
VIII	79	100	83	102	79	101	78	95
IX, Commercial	81	100	83	102	82	98	83	97
IX, Technical Arts	79	100	86	98	81	100	84	101
All	80	100	84	101	80	100	82	99

The mean EQ's and the mean subject quotients for each of the eight groups establish that these groups fall within the limits of dullness and normality, whichever the case may be, according to the commonly accepted psychological interpretation of the terms.

Achievement in Academic Subjects

To find the achievement of the dull and average pupils in the four academic subjects —English, mathematics, social studies, and science—a subject age in each of the four studies was computed for each child. These subject ages were based on the results of the respective tests in the Stanford Achievement battery. The purpose of these subject ages was to compare the dull and average children according to standard norms. Further, minimum essentials tests were constructed cooperatively by the teachers in each of the four academic departments of the school. These tests were given in order to compare the dull and average groups in the actual current work of the curriculum. Both the individual tests of the Stanford battery and the minimum essentials tests constructed within the school were checked for reliability and validity.

Two measures of comparison were employed. The first was percentage of average performance by dull pupils and the second was percentage of overlapping. Overlapping was considered in the sense of "the percentage of scores which the two distributions have in common."[4] In computing the percentage of overlapping according to the interpretation herein stated, the difference between the groups is first expressed as a difference between the means in units of true sigma scores ($\frac{M - M_1}{\sigma \infty}$). For this difference, a table states the percentage of scores in common, also the standard error of the percentage expressed as a multiple of N (the size of the group). The table is based upon the normal probability integral and hence assumes normal distributions.

The following tabulation shows the percentage of average performance by dull pupils.

Academic Subject	Subject Age	Minimum Essentials	Mean
English	87	83	85
Mathematics	92	79	86
Social studies	87	77	82
Science	90	80	85
All	89	80	85

Averaging the eight per cents of average performance by the dull pupils in the foregoing tabulation, it may be said that the dull children performed 85 per cent as well in academic subjects as did the average children.

The percentage of overlapping in the two groups is shown in the following tabulation:

Academic Subject	Subject Age	Minimum Essentials	Mean
English	35	34	35
Mathematics	76	70	73
Social studies	61	51	56
Science	60	46	53
All	58	50	54

[4] This statistical method was suggested by Professor J. Warren Tilton of Yale University. It is described by him in an unpublished paper entitled, "The Measurement of Overlapping."

Averaging the eight per cents of overlapping in the four academic subjects as set forth in the foregoing tabulation, it may be said that 54 per cent of the dull and the average children showed common performance in the academic work of the junior high school.

Achievement in Nonacademic Work

Teachers' marks were relied upon in shop work for boys, in domestic science for girls, and in music, art, and gymnastic work for both boys and girls. In all these subjects except art, teachers were given written directions of which the following is a sample:

> "Please mark these children on their actual manual accomplishment as shown by the products that they have made. Do not take into consideration any opinion you may have of the child himself. Mark the products from your standards of what an A, B, C, D, or F product would be in your shop."

In art, each child's drawing envelope containing a half year's work was marked independently by each of the three art teachers. In shops, domestic science, and music, from two to six teachers, depending upon the size of the department, marked each child. The marks for each child in a given subject were averaged to give a mean mark for that subject. In gymnastic work, one teacher's marks had to be relied on for all boys and one teacher's marks for all girls. The reliability of the teachers' marks were obtained in each subject except gymnasium.

The results of these marks on dull pupils are presented below:

Academic Subject	Per Cent Average Performance	Per Cent Overlapping
Shops	100	91
Domestic Science	82	68
Music	79	73
Art	100	100
Gymnasium	100	100
All	91	86

Social and Civic Participation Within the School

To make comparisons regarding social and civic participation within the school, certain combinations of subject teachers and the home-room teacher of each group were requested to rate the pupils on certain activities which indicate social and civic participation within the school. The activities included:

Special work like projects, etc., not required but done on the child's own initiative
Member of committee of any kind
Special activity indicating a good social and civic attitude
Part in dramatization
Part in entertainment
Special work in club
Part in assembly
Member of athletic team
Home-room officer
Club officer

The teachers were asked to rate each child as follows:

If a child has done:

Many of these things and frequently, mark him 3
Some of these things and occasionally, mark him 2
Few of these things and seldom, mark him 1

The teachers' marks were checked for reliability.

When the marks for each child were obtained, they were averaged and the child was given a mean mark in social and civic participation within the school. The results were that the participation in these activities by dull children was 92 per cent of the average children and that the overlapping was 84 per cent.

To check further on social and civic performance, data were gathered from the permanent record cards of the pupils. On these cards there is kept a record of all offices a child has held while in the school and any signal achievement outside of the ordinary curriculum to which he has attained. The items that were used were:

Officer of club
Captain of varsity team
Member of varsity team
Chairman of a committee (school, not room)
Officer of Safety Council
Officer of School Council
Citizenship Honor Roll
Color Guard
Winner of medals
Winner of essay contest
Winner of poster contest

The result of this part of the investigation showed that the dull groups had eighteen outstanding achievements to their credit and the average groups had nineteen such attainments to their credit.

Summary of Findings on School Achievement

A summary of the school achievement of the dull pupils as compared with the average pupils is given below:

School Achievement	Per Cent Average Performance	Per Cent Overlapping
Academic	85	54
Nonacademic	91	86
Social and civic participation	92	84

Averaging the three per cents of average performance by the dull children, it may be said that the dull children performed 89 per cent as well as the average children in this investigation of junior high school work.

Averaging the three per cents of common performance, it may be said that 74 per cent of the dull and average children performed similarly in the work of the junior high school that was examined in this study.

Conclusions

The foregoing evidence leads to the conclusion that the difference between average children as a group and dull children as a group is not very great as far as junior high school work is concerned. The greatest difference is in academic work which is usually the basis upon which the distinction between dull and average children is made. Yet even here, the fact that there is 54 per cent of overlapping indicates that many dull pupils perform as well as average pupils and that many average pupils perform as poorly as dull pupils.

Adjustment After Leaving the Junior High School

Selection of Groups

One hundred five dull pupils (EQ below 85) were chosen from all dull pupils who entered the Fair Haven Junior High School in 1927, 1928, and 1929. These pupils were selected on the basis of two achievement tests, one which had been given them before entering the school and the other which was given them while they were attending the school.

These 105 dull pupils were matched with 105 average pupils (EQ 95 to 105) selected in the same manner as were the dull pupils. The two groups were matched for year of entry, nationality, sex, and social and economic background.

A questionnaire concerning schooling, work, marriage, and opinions of the junior high school was sent to each of the 210 pupils selected. The questionnaires of eighty-three matched cases were returned and these were used as a basis for study. The questionnaires were checked by personal visits to approximately 90 per cent of the 166 pupils whose questionnaires were returned.

The delinquency of the two groups was also studied.

Findings

Schooling.—The dull children, as a group, had 85 per cent as much schooling as the average children although 67 per cent of the two groups had the same amount of schooling. The mean schooling of a dull child was 9.3 years; of an average child 10.9 years.

Seven of the dull children were graduated from high school. Six of these were boys. The EQ's of these seven children were at the higher end of the dull group. Further, these seven children were products of the better homes of the neighborhood. In six of the cases there was a driving motive to keep the child in school. Five of these children did well in some part of the school curriculum and in only one case was character rated low by the teachers whom the pupils had in both the junior high school and the senior high school.

Work Experience.—Considering the time out of school for both groups, the dull children performed 93 per cent as well as the average children in employment. In unemployment, the dull performance was 98 per cent of the average performance, and in wages the dull showed 97 per cent of the average accomplishment. Averaging these three items together, it may be said that in work experience, dull pupils showed 97 per cent of the accomplishment of average pupils.

The per cents of overlapping in the sense of common performance were as follows: employment 65, unemployment 85, and wages 97. Averaging these three items together, 82 per cent of the dull and average children performed similarly in their work experience according to the best computations that could be made of this.

Marriage and Delinquency.—These topics were grouped together because in both the dull and the average groups there were few marriages and few delinquencies. The following tabulation show the numbers in each group.

Marriages

Years	Dull	Average
less than 1	2	0
1	1	1
2	0	1
3	3	0
4	1	1
6	8	3

Delinquencies

Offenses	Juvenile Court Dull	Juvenile Court Average	City Court Dull	City Court Average
1	2	2	1	0
2	1	0	0	1
3	0	0	1	0
4	0	1	0	1
5			0	1
7			1	0

Pupils' Opinions of the Work of the Junior High School

The opinions of former pupils regarding junior high school work were quite similar for the dull and average groups. Both groups considered subjects that have actual utilitarian value in their present lives of most importance. The pupils' opinions on the various school subjects are shown below:

Place	Dull	Average
1	Shops*	Shops
2	English	English Mathematics
3	Mathematics	Vocational subjects**
4	Penmanship Gymnasium	Penmanship
5	Vocational subjects*	Aesthetic subjects*** Gymnasium
6	Aesthetic subjects	High school subjects‡
7	Science	Social studies
8	Social studies	Science
9	High school subjects	

* "Shops" includes woodwork, printing, metal work, mechanical drawing, commercial art, general shop, foods, and clothing.

** Vocational subjects include typing, business practice, and occupations.

*** Aesthetic subjects include art and music.

‡ High school subjects include algebra, European history, and languages.

The opinions of the groups regarding the value of junior high school subjects do not coincide with the time spent on the subject in school. The tabulation below shows the subjects in order of the time each group spent on the subject while in the junior high school.

Order	Dull	Average
1	English	English
2	Mathematics	Aesthetic subjects
3	Aesthetic subjects	Mathematics
4	Social studies	Social studies
5	Science	Shops
6	Shops	Science
7	Gymnasium	High school subjects
8	Vocational subjects	Gymnasium
9	High school subjects	Vocational subjects
10	Penmanship	Penmanship

Sixty-one per cent of the dull children and 60 per cent of the average children found club work useless; among those who did find it of value, 8 per cent of the dull group and 6 per cent of the average group were unable to give reasons in support of their opinions.

Fifty-nine per cent of the dull group and 49 per cent of the average group found the guidance activities of the school of no value. Of those who did find them valuable, 11 per cent of the dull group and 5 per cent of the average group could give no definite reason for this value.

Twenty-six per cent of the dull children and 28 per cent of the average children were capable of giving definite, intelligible answers to the question, What part of your junior high school experience do you consider the most valuable to you at the present time?

Ten per cent of the dull children and 25 per cent of the average children could give a definite, intelligible suggestion in answer to the question, How do you think the work of the junior high school can be improved?

Conclusions

The similarities between dull and average children have been more striking in this study than the dissimilarities.

Dull and average children are most dissimilar in academic work and amount of schooling. Since these are both phases of the same experience, averaging the per cents of overlapping in these matters, it may be said that 61 per cent of both groups showed common performance. Averaging the per cents of average performance by the dull pupils, dull

pupils accomplished 86 per cent of what average pupils accomplished in academic work and length of schooling. This is somewhat better than the mean EQ of the dull groups would lead one to expect.

Considering both measures employed, the greatest similarities are found in social and civic participation within the school and work experience outside the school, although the similarities in nonacademic work within the school are not far behind these first two items. The similarities and dissimilarities of the two groups are shown in the following tabulation:

Experience	Per Cent Average Performance	Per Cent Overlapping
Academic work	84	54
Length of schooling	85	67
Nonacademic work	91	85
Social and civic participation	92	85
Work experience	97	82
Mean	90	75

Dull and average children for the most part found school work valuable only in so far as it has present utilitarian value. Both the dull and the average children for the most part have but a vague idea of what bearing junior high school life has on life in general.

Implications and Suggestions for the Curriculum

Inasmuch as the dull and the average children are least similar in academic work in school and inasmuch as school is based for the most part on academic work, dull children do not have equal educational opportunity with average children in school life. This inequality possibly may be eradicated if there be differentiation of courses earlier than at present, or, if the academic work be made more practical and have a distinct bearing on life for those children who are not academically minded.

The present junior high school does not take into account as much as it should either the interests or the abilities of both average and dull children. It is believed that if children cannot make intelligent judgments on the value of school experience, which is a large part of their lives over a period of years, they will be less capable of making intelligent judgments on civic and social matters pertaining to the democracy with which their experience is remote and indirect. Somehow the curriculum should teach not only the values of subject matter along with the subject matter but also the means of judging these values.

For real equality of educational opportunity, the curriculum should take into account, more than it does, individual differences in both the dull and average groups in all phases of junior high school work. There should be less dependence on so-called homogeneous grouping which is based for the most part on such academic qualifications as IQ, EQ, and educational achievement and which fail to take into consideration other than academic phases of school work.

Since the work of the "dull" and the work of the "average" is not markedly distinguishable, this nomenclature is misleading in our school procedures.

A MULTIPLE FACTOR STUDY OF EIGHTEEN ANTHROPOMETRIC MEASUREMENTS OF IOWA CITY BOYS AGED NINE DAYS TO SIX YEARS*

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INTRODUCTION

The factor problem—the problem of mathematically analyzing measured traits into their elemental or unitary components—dates back to 1904 when Professor Charles E. Spearman (10, 16) introduced his two-factor theory. This theory was based on the assumption that any battery of mental tests has one common factor and that each individual test of the battery has in addition a specific factor which is unique for that item. This theory made a contribution but was inadequate for application in research areas where there was more than one common factor or where several group factors were present. In 1928 Professor Truman Kelley (4), now at Harvard University, presented a method in which he attempted to overcome the shortcomings of Spearman's method. This method was at once highly complex and limited in the scope of its application.

After several years of preliminary experimentation, Professor L. L. Thurstone (11) of the University of Chicago published in 1931 a theory of multiple factor analysis by the use of which any number of common group factors might be isolated and weighted. The numerical values of the finally adjusted weightings correspond to zero-order correlations between the factors and the variables in which they are present. According to Thurstone, a common factor in general is an elemental or unitary ability, component, or basic trait which is common in greater or lesser degree to all the variables, and a group factor is one which is present in a number of variables but not in all. Each group or common factor is assumed to be uncorrelated (16, p. 50–53) with the other group or common factors. Common factors were first determined by a least squares method, but Thurstone later developed a so-called center of gravity method which will be discussed. In this technique, the final adjustment of the factor loadings is accomplished by what is termed a "logical method." Applied to psychological tests he found that the method isolated such factors as verbal ability, mechanical ability, memory of numbers, spacial imagery, etc. In other fields the factors vary, as for example in motor abilities where such factors as strength, speed, and motor educability have been identified (7, 19).

Professor Harold Hotelling (3) of Columbia in 1933 and Professor Kelley (5) in 1935 developed further methods of factor analysis, but some of the assumptions necessary to the use of these methods seem untenable to the writer (See discussion in Thurstone (16, p. 129–133) and on page 213 of this study); hence the Thurstone technique is used in this investigation.

In the field of anthropometry, multiple factor analysis is at an early experimental stage. At the time the present research was projected the only application known to the writer was an unpublished study (7, p. 26–32) by Professor Charles H. McCloy of the Iowa Child Welfare Research Station. This study consisted of a survey analysis for eighteen anthropometric measurements at selected ages between birth and eighteen years. For males, analyses were made at nine days of age and at ages four, six, ten, fourteen, and eighteen years. For females, parallel analyses were made at ages nine days and four, six, ten, and thirteen years. Three group factors were found. These were tentatively identified as (1) a factor of "linear growth," (2) a factor of "cross-sectional growth" and (3) a factor of "fat growth." The first was largest in

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height and in sitting height, the second in muscle girths and chest dimensions, and the third in measurements of the thickness of skin and subcutaneous tissue.

More recently (March 1936), Carter and Krause (1) published a study in which they gave the results of a factor analysis of eighteen external dimensions of newborn infants. Thurstone's simplified multiple factor method was employed. The dimensions analyzed included seven gross body dimensions, three hand measurements, and eight measurements of the head and face. Two separate studies were made, one on 608 newborn males and the other on 609 newborn females. Four factors were found, and the results were materially the same for each sex.

"The first factor loadings are all positive, and comparatively heavy for all of the 18 variables." (p. 63) "Factor I is apparently a measure of size in general." (p. 64)

"It appears that Factor II is a composite of contrast effects. The contrast seems to involve length measurements and weight positively weighted, and the measurements of face, hands, and pelvis negatively weighted." (p. 65)

Factors III and IV are also of contrast nature but are of less significance.

The authors made no attempt to identify biologically factors II, III, or IV, nor do they indicate how factor I (size in general) could be independent of the subsequent factors. They emphasize the fact that their study is on infants and the results may not apply to older subjects.

The present investigation was undertaken in an attempt to discover what contributions the method has to offer by an intensive study of the age period between nine days and six years.

Statement of Problem

The purposes of this investigation were (1) to make an intensive study of a limited age period in which growth is rapidly taking place and (2) to discuss the findings with a view to pointing out the contributions and limitations of both method and results.

Data

The data for this study consist of approximately 15,000 physical measurements taken on 850 white boys under six years of age. There are nine age groups as follows:

Age Interval	Cases
9 day-old infants	47
6 through 8 months	98
12 through 17 months	138
18 through 23 months	113
24 through 29 months	100
30 through 35 months	100
36 through 47 months	107
48 through 59 months	90
60 through 71 months	146

The measurements are weight; height; sitting height; bi-deltoid and bi-iliac diameters; bi-condylar width of knee and elbow; width, depth, and circumference of chest; girths of upperarm, forearm, thigh, and calf; thickness of skin and subcutaneous tissue on arm front, arm back, chest front, and chest back. The measurements were made by using the technique commonly employed in the Iowa Child Welfare Research Station (7, p. 114–123 and 9, p. 125–128).

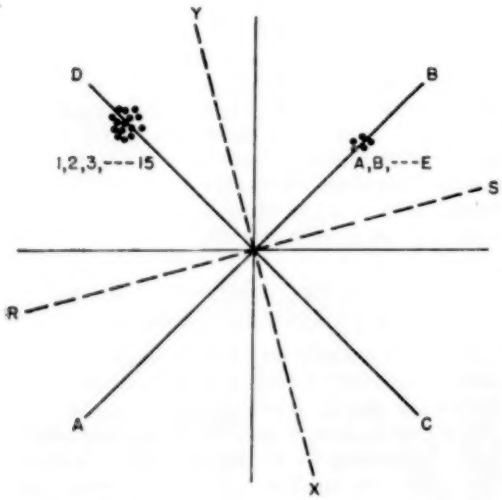
Method of Obtaining the Solution For a Factorial Matrix

The true weightings of the factors or components are not readily determined since the unrotated factor loadings obtained by the Thurstone technique furnish coefficients which lend themselves to several possible solutions. The interrelationships of the variables are correct, but the orientation in space is uncertain and a function of the method used. The variables must be "rotated" to their "true" planes of reference. This may be in any number of dimensions depending upon the number of factors isolated. The least squares method of solving has been suggested by Kelley (5) and Hotelling (3), but this can be readily shown to be fallacious as it is unduly affected by the number and position of variables contained in the analysis. A few variables heavily weighted with one factor vary the loadings as can be seen in the following hypothetical situation. In an analysis where there are only two factors present and one is highly correlated with variables 1, 2, 3,—n and the other is highly correlated with variables a, b, c, —z, it is evident that the number of variables present in each group determines the position of the planes located by the least squares method.

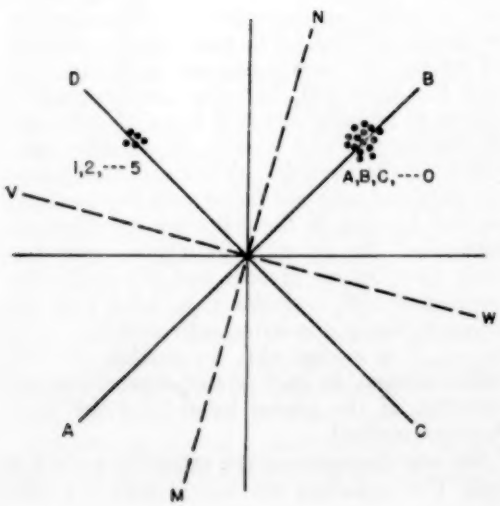
In the diagrams on the following page AB and CD represent the logical axes, i.e. the

axes, arrived at by inspection, which will meet the assumption that the factors are uncorrelated. XY and RS represent the axes determined by the least squares method in problem 1 while NM and VW represent the axes determined by the least squares method in problem 2. The only difference between the two problems is that the number of variables in the upper right quadrant and the upper left quadrant in problem 1 has been reversed in problem 2. Thus the axes have been rotated approximately 30° by the least squares method while the desired axes remain in practically the same place for both problems.

PROBLEM 1



PROBLEM 2



More recently what might be called a "logical" technique has been used effectively by Thurstone and McCloy. "Logical" as used in this connection means that the investigators plan rotation in the light of their technical knowledge and research insight relative to the variables under analysis. They are aided in this by having a graphical distribution of the variables as projected to communalities of unity on a blackboard globe the center of which is considered the origin. Orthogonal planes may then be constructed through points which are assumed to be uncorrelated with the other factors and the new loadings are obtained from these rotated planes. This method offers little difficulty in an analysis containing no more than three group or common factors, but the presence of four or more such factors necessitates a modification of the technique. It is possible to graph only two or three factors at one time, and this is not always satisfactory since the omission of one or more factors tends to distort the position of those variables correlated with the omitted factors. The methods employed to rotate four or more factors will be discussed on subsequent pages.

Rotation of Axes

Unrotated loadings for four factors were computed for each age group. At some ages the third factor residuals were nearly zero while in others they were large enough to warrant the computation of the fourth factor loadings. The unrotated fourth factor loadings seemed large enough to indicate the presence of a significant fourth factor in several age groups, but as an additional check factors, I, II, and IV were plotted on the globe in each instance. The results indicate that there was a fourth factor present in all age groups between six months and three years inclusive, although in the three-year-old group it was less significant than in the others. The fourth factor residuals and fifth factor loadings were found to be practically zero in each of these age groups, thus eliminating the possible presence of a significant fifth factor. Only three factors were found in the nine-day-old group, four-year-old group, and five-year-old group.

Treating each age group separately, the variables were plotted on a blackboard globe. The three factor groups were rotated first, as they were less difficult, and hence they will be discussed first. Applying Thurstone's method of rotating planes, the original factor loadings of the two variables selected to locate plane I were inserted into the simultaneous equations which satisfy these conditions.

(1) $ax_1 + by_1 + cz_1 = 0$
$ax_2 + by_2 + cz_2 = 0$
and (2) $a^2 + b^2 + c^2 = 1$

in which x, y, and z are the original factor loadings of factors I, II, and II and a, b, and c are the direction cosines of plane I which give the adjusted values to factor I.

The corrected values of factor II are found in the same manner except that a, b, and c of factor I become the coefficients of one of the linear equations in finding factor II and the factor loadings of one variable are the coefficients of the other. In finding the corrected loadings for factor III, the coefficients of both linear equations are a, b, and c of factors I and II respectively.

The selection of the points through which the orthogonal planes were drawn required a large amount of study involving considerable trial and error. First considerations pointed to height and sitting height as primary points of reference since it had been suggested that these two measurements were most representative of a so-called "linear" factor. This theory was later abandoned in view of the fact that sitting height contains no long bones and the similarity of these two measurements appeared not to be due to the long bones but to some other cause which has not been determined. After plotting several age groups and considering the relative position of the variables on the globe, it seemed that the most logical method of approach lay in using the skin and subcutaneous tissue measurements and the limb girths to locate the first plane. The skin and subcutaneous tissue measurements were hypothesized as relatively "pure" because of their position on the globe and their relatively low correlations with other variables except the limb girths.[1] The limb girths were not considered to be as "pure" as the skin and subcutaneous tissue measurements, but since these measurements formed a separate cluster near the one formed by the skin and subcutaneous tissue measurements and since all eight measurements fell along a straight line, one from each group was used to locate the first orthogonal plane. The decision to use one of the skin and subcutaneous tissue measurements to locate the second orthogonal plane was more or less arbitrary, but at the same time it was in keeping with the selection of the two points on the first plane since those measurements which fall along the intersection of two orthogonal planes will be at a maximum distance from the third and hence will have the largest factor loadings for the third orthogonal plane. The third plane automatically falls into place. In order that the results for each age group might be comparable, one measurement nearest the center of the skin and subcutaneous tissue measurements and one measurement nearest the center of the limb girths were used to locate the first plane.

The rotation of four factors is more complicated than that for three. One of the criticisims of the logical method of rotation is that one may alter the results through the selection of points by which the planes are located. With only three factors present, several solutions are possible and no less than two were found for each age group.[2] In the case of four factors, four different rotations were made on one age group before the method used here was selected. The points chosen seemed to be the most logical ones and as they remain uniform, the results for different ages are comparable. The question still remains, however, whether or not another individual using the same data would have used the same points of reference in rotating the planes. To arrive at a logical and useable technique, four separate analyses were computed on the two-and-one-half-year-old group which was arbitrarily selected. The first one included all the variables, the second omitted those which seemed to be correlated with factor IV, the third omitted variables apparently correlated with factor III, and the fourth analysis omitted the skin and subcutaneous tissue measurements. The above procedure served as a check on the position of the variables on the globe in three dimensional relationship and aided materially in locating the planes. Three points on the globe are required to locate the first of four orthogonal planes. Following

[1] The mean r of the skin and subcutaneous tissue measurements with the limb girths was .42 (range, .05 to .66) and with other variables .22 (range, —.20 to .65).

[2] One solution was found by using the least squares method to locate the first plane, another by using height and sitting height as primary reference points, and a third is described here.

considerable investigation involving more trial and error technique in which all four different factor analyses were used, a uniform method was adopted. The first three points were taken from the eight skin and subcutaneous tissue and limb measurements for reasons mentioned in discussing the three factor rotations and since their position on the globe is least distorted by the presence of a fourth factor. The second orthogonal plane requires two points to locate it, and the points indicated by height and sitting height were used for this since they fell in a plane perpendicular to the first plane. The third orthogonal plane, which is comparable to the second plane of the three factor rotation, was drawn through one of the skin and subcutaneous tissue measurements, and the fourth plane automatically falls into place. The same method of securing direction cosines was employed as for the three factor rotations except that four simultaneous equations of four terms each are required in a four factor rotation. The rotated or corrected loadings for four factors were thus computed for each of the age groups in which four factors were present.

Experimenting with an idea which arose from the four separate analyses on the two-and-one-half-year group, each age group having four factors was treated in the same manner. The first of these groups of analyses as has been said was made for the purpose of checking the location of the points in the three dimensional relationship and was a valuable aid as such.

The other groups of analyses were made to determine whether variability between the age groups remained when the factor loadings were obtained a few at a time or whether it disappeared. If it disappeared, it was possible that the difficulties involved in rotating four factors might be responsible for it. Within each age group, three separate analyses were made in each of which the variables that were apparently correlated with one factor were omitted. The results secured from these analyses were combined so that the loadings would be complete for each variable for each of the four factors. The results exhibited slightly less variability between age groups, but even had the variability been practically eliminated the writer does not feel that he would be justified in using these results in preference to those obtained by rotating four factors at one time. However, the loadings are included in the Appendix.

Identification of Factors

Of the four factors which have been found, only one has been even tentatively identified. Factor I, which is largest in the measurements of skin and subcutaneous tissue and which is also large in the limb girths, has been called a "fat factor." The writer is cognizant of the fact that in using the skin calipers one measures a double fold that consists of both dermal and adipose tissue in varying amounts. Furthermore, since the amount of skin and subcutaneous tissue on the body of the growing child probably affects the magnitude of his limb girths to a greater extent than it affects his other anthropometric measurements, it seemed logical to assume that the factor which has its maximum value in the skin and subcutaneous tissue measurements and the next highest value in the limb girths could be termed a "fat factor." Just what biological phenomena lie back of the development of skin and subcutaneous tissue are not considered here.

If the method of rotation be recalled, it appears that the presence of some type of "fat factor" was assumed when the first and one other orthogonal plane were so selected that the skin and subcutaneous tissue measurements fell at the intersection of the two planes. In other words, after plotting the points on the globe it is almost necessary to identify one factor before the position of the first plane can be satisfactorily determined. The locations of the other planes which are constructed perpendicular to the first and to each other are determined by the position of the variables on the globe and the identity of the other factors need not be known. The interpretation of the other factors will be discussed subsequently.

Results

Comparison of the results was facilitated by the use of graph paper. Plotting each variable separately with age as the abscissa and values from —1.00 to +1.00 as the ordinate, the value of each of the factors was plotted for each age. By connecting the points between ages, three or four curves[3] were present for each variable and the weighting of each factor present in each variable at each age was recognizable at a glance.

[3] There are four factors present between six months and four years.

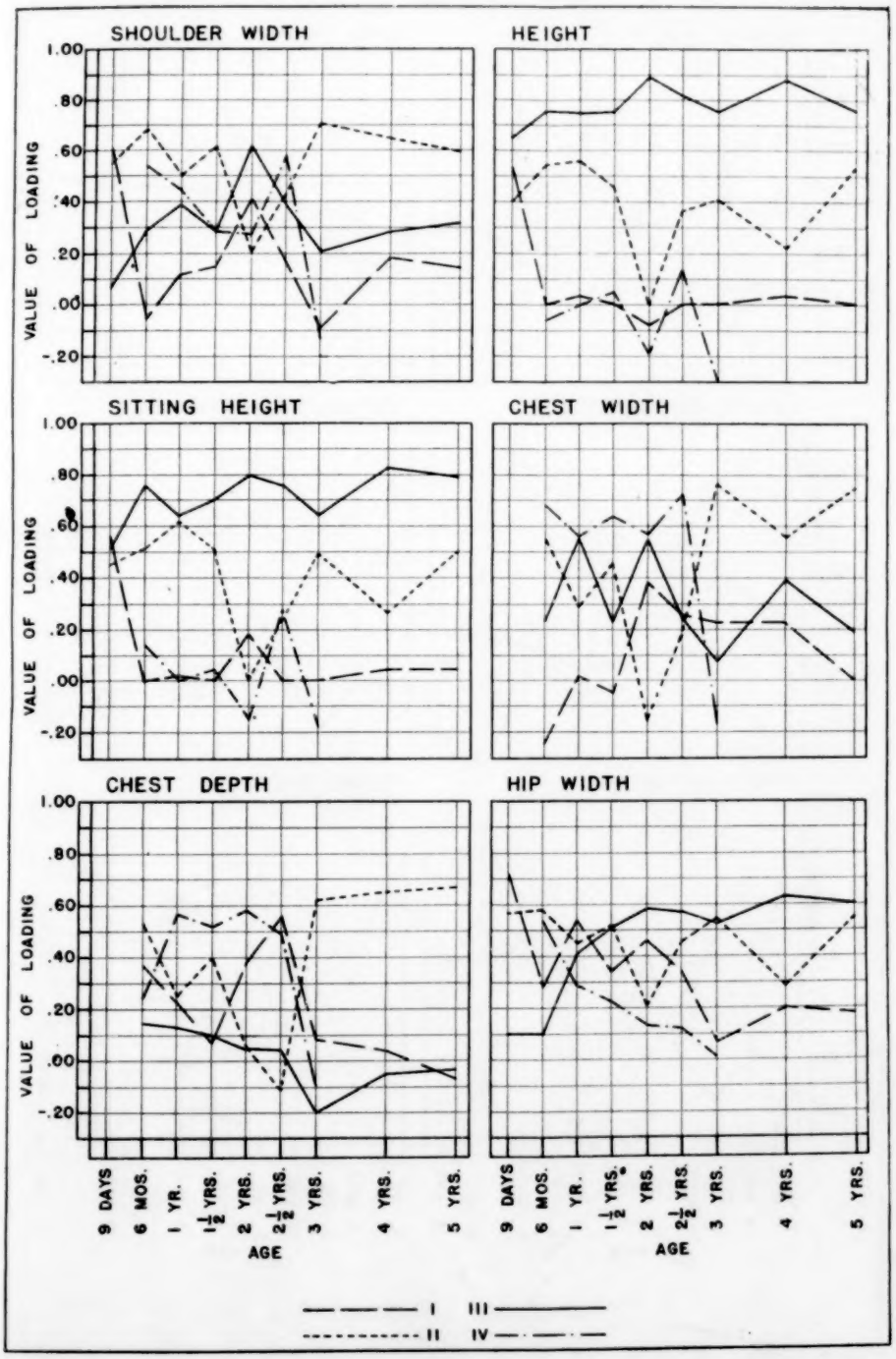


Figure 1. Graphs Drawn to the Rotated Factor Loading Values for Factors I, II, III, IV.

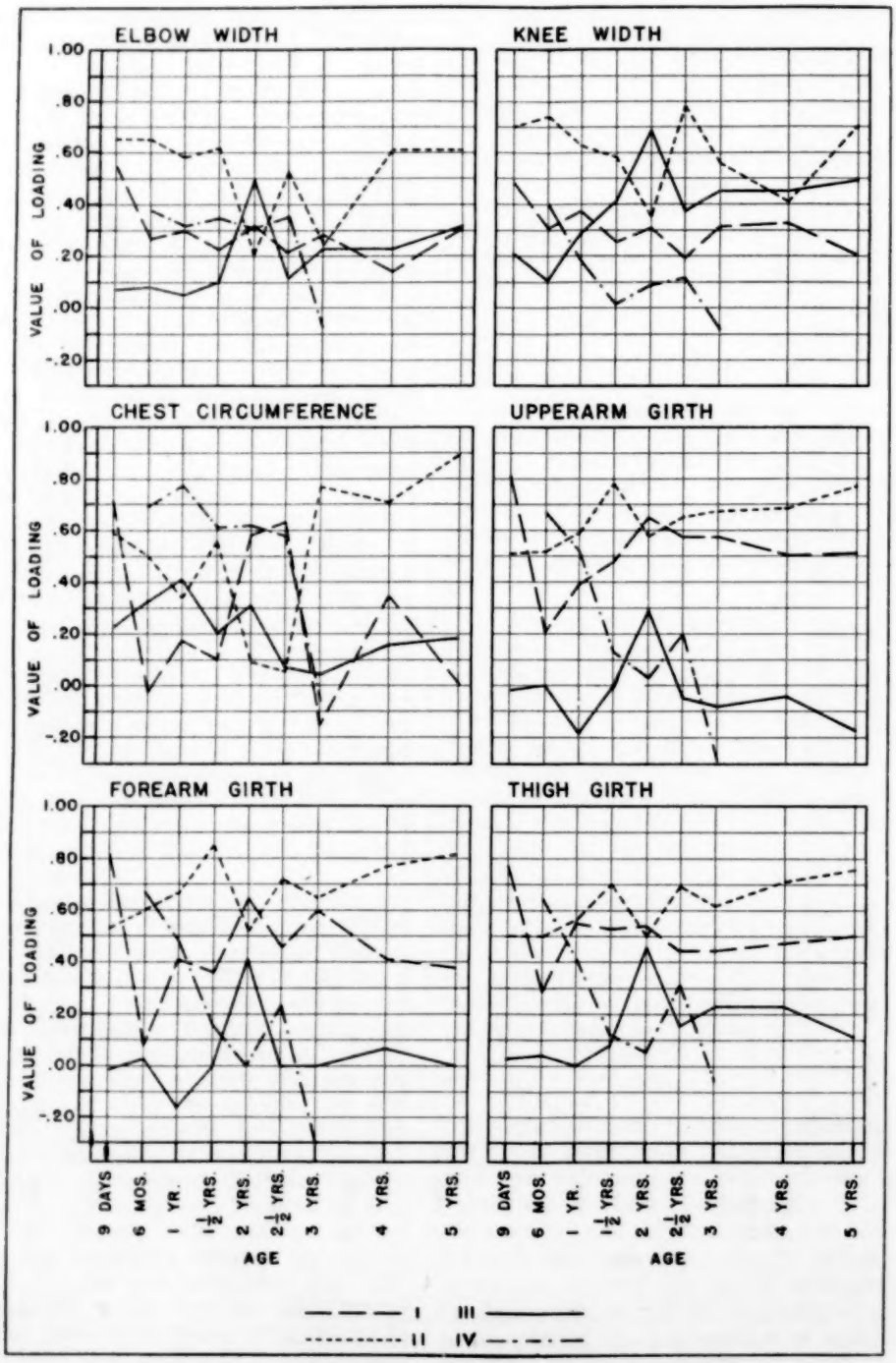


Figure 1 (Continued). Graphs Drawn to the Rotated Factor Loading Values for Factors I, II, III, IV.

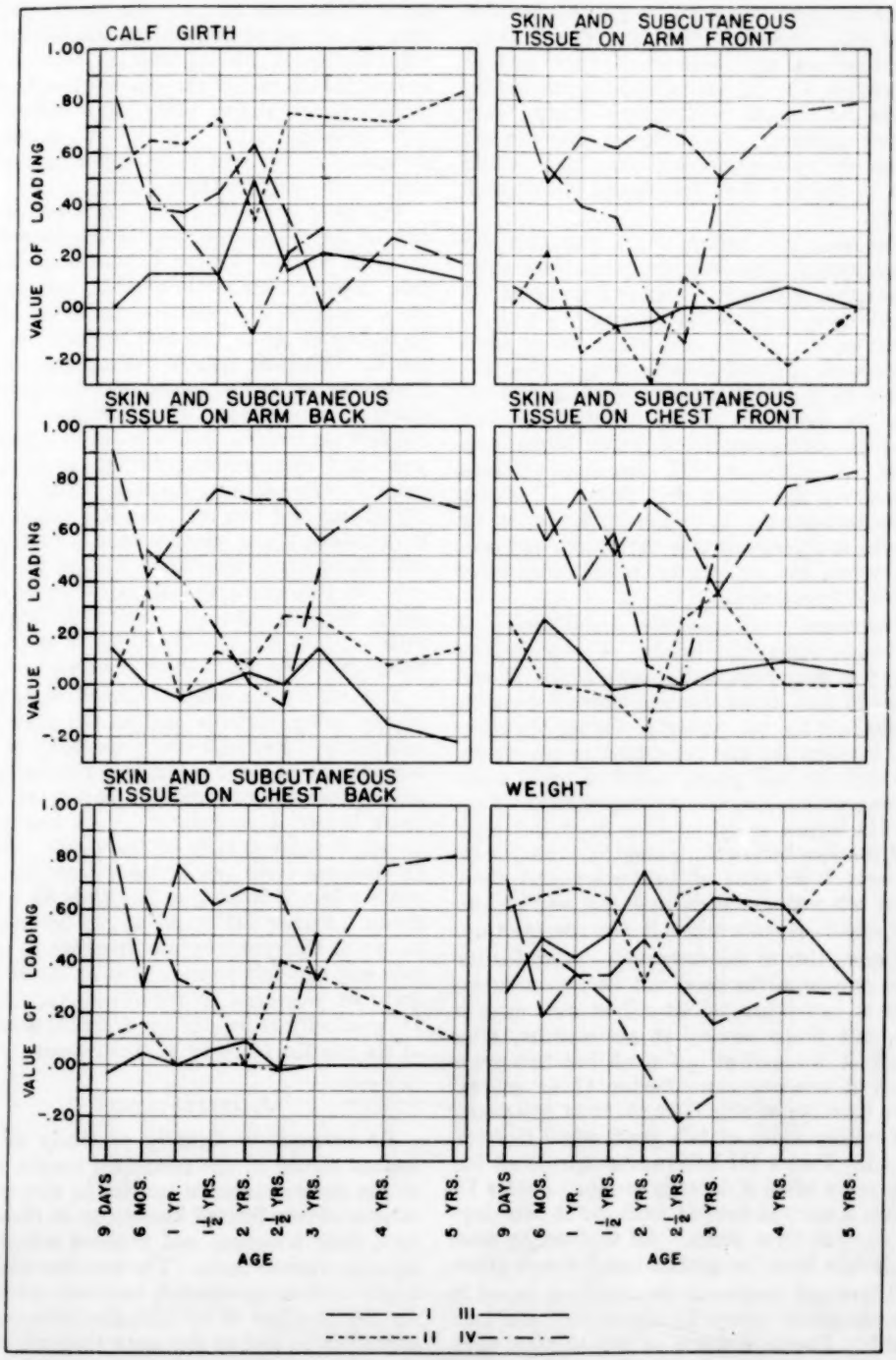


Figure 1 (Continued). Graphs Drawn to the Rotated Factor Loading Values for Factors I, II, III, IV.

Careful comparison of the graphs revealed those with similar trends. Six different types were disclosed and those of one type, such as the curves for the fat measurements or the curves for height and sitting height, were plotted together. No markedly different sets of curves were combined, since this would tend to obscure the character of the original curves.

The composite curves of the four skin and subcutaneous tissue measurements show some decussation with age. Factor I starts at .88 at nine days and remains between .64 and .78 except at six months and three years, when it drops to .44 and is crossed by factor IV. Factor II is found between +.09 and —.09 with the exception of six months, two and one-half years, and three years, when it is about .25. Factor III remains at zero throughout age range, but factor IV shows some fluctuation. It originates at .60 at six months and descends to —.07 at two and one-half years, but ascends to .50 at three years where it terminates.

The crossing of composite curves is minimal for height and sitting height. Factor I starts at .53 at nine days but crosses factor II and drops to zero at six months, where it remains throughout the age studied. Factor II fluctuates between .40 and .57 except at two years, two and one-half years, and four years when it drops to .00, .30, and .25 respectively. Factor III begins at .58 at nine days and after that remains between .70 and .85. Factor IV deviates from zero at two years and three years when it descends to —.20 and at two and one-half years when it ascends to .20.

Description of the composite curves for the four muscle girths need not be extensive except at two years. Factor I at nine days is .80, but drops to .23 at six months, after which it is found at .40 at all but two years when it reaches .60. Factor II in general rises from .52 at nine days to .80 at five years, but makes a dip at two years when it drops to .48. Factor III hovers near zero at all but two years when it ascends to .40. Factor IV makes a marked descent from .60 at nine days to —.27 at three years. All four curves seem to deviate from the general trend at two years.

There are numerous decussations found in the composite curves for elbow, hip, and knee width. Factor I starts at .58 at nine days, but drops to .29 at six months and is between .30 and .40 until two and one-half years, after which it remains at .25. Factor II remains near .60 except at two, three, and four years, when it dips to .26, .44, and .43 respectively. Factor III ascends from .10 for the first six months to .60 at two years, after which it is approximately .40. Factor IV makes an elongated S in its descent from .44 at six months to —.05 at three years.

The most irregular curves are found in the case of the three chest measurements and the shoulder width. Factor I falls from .63 at nine days to zero at six months, and after a slight hump at one year returns to .07 before ascending to .40 at two and two and one-half years. Dropping again to zero at three years, it rises to .20 at four years and finally terminates at zero. Factor II, which is at .58 for the first six months, makes a dip to .35 at one year and then returns to .50 at eighteen months before making another dip to .05 and .14 at two and two and one-half years, prior to its return to .70 where it ends. Factor III, with three exceptions when it rises to .35 at one and two years and drops to .03 at three years, remains near .20. Factor IV approximates .55 at all ages in which it is present except at three years when it drops to —.10.

The curves for weight differed from those of any other variable and so are considered separately. Factor I drops from .72 at nine days to .20 at six months and returns to .48 at two years, but descends to .15 at three years before it ascends to .27 at four years, at which point it ends at five years. Factor II deviates from .70 at two, four, and five years when it is at .32, .52, and .82 respectively. Factor III starts at .29 but ascends to .70 at two years before dropping to .50 at two and one-half years. It is at .62 at three and four years and terminates at .32. Factor IV gradually fades out by dropping from .45 at six months to — 15 at three years.

Interpretation

An attempt to identify postively all four factors shown in the preceding results would at the present time be unwise in view of the comparatively limited knowledge of these factors, their meaning, and changes which they incur at various ages. The best one can hope to do until more research has been completed on the problem is to indicate some possible explanations and at the same time raise questions for which the answers as yet have not been found.

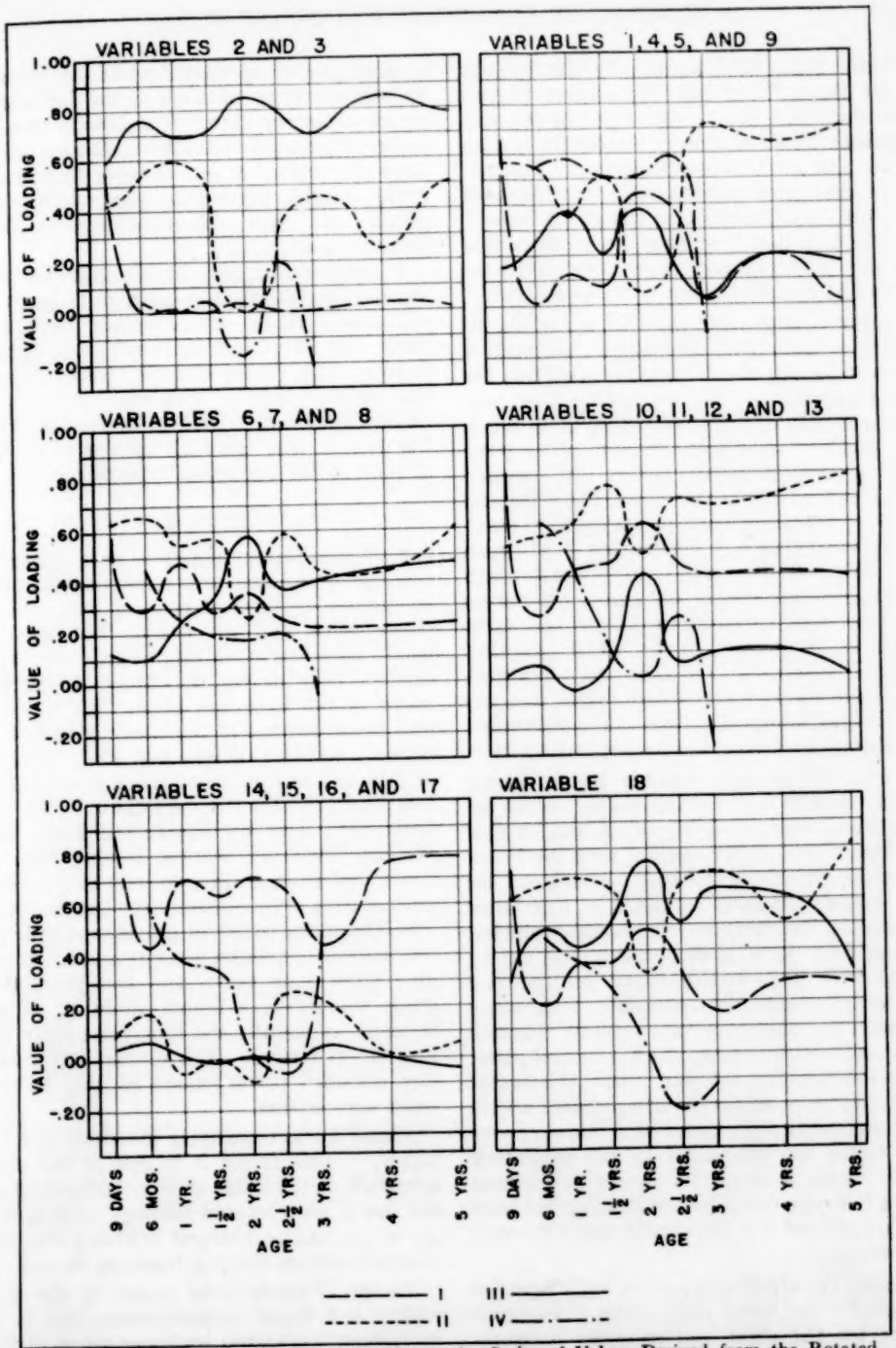


Figure 2. Six Graphs Drawn to the Composite Series of Values Derived from the Rotated Factor Loadings for Factors I, II, III, IV.

Variables.

1. Shoulder width
2. Height
3. Sitting height
4. Chest width
5. Chest depth
6. Hip width
7. Elbow width
8. Knee width
9. Chest circumference
10. Upperarm girth
11. Forearm girth
12. Thigh girth
13. Calf girth
14. Skin and subcutaneous tissue on arm front
15. Skin and subcutaneous tissue on arm back
16. Skin and subcutaneous tissue on chest front
17. Skin and subcutaneous tissue on chest back
18. Weight

Factor I has been tentatively identified as a "fat factor," but any explanation of just what this "fat factor" represents in the way of growth would be only a conjecture and an answer will not be attempted here. The preceding discussion substantiates, for the most part, the theory that factor I is a "fat factor," but the fact that it reaches .40 at three and one-half years in the three chest measurements and shoulder width is not consistent.

Factor II appears to exert its maximum influence in limb girths and weight, although it seems to be significant in everything but the fat measurements. Since it is largest in those measurements which involve growth in depth and width, it has been thought of as some type of cross-sectional factor. Its marked variation with age in the case of the chest and shoulder measurements is apparently unexplainable. Since it is known that chest depth does not have the same ratio to chest width at all ages, one would not expect the curves of these two variable to follow the same trends as they seem to do. The fact that factor II enters into the skin and subcutaneous tissue measurements and height and sitting height, moreover, does not substantiate the theory that it is a cross-sectional factor.

Factor III appears largest in height, sitting height, weight, and bi-iliac width. Since its maximum occurred in height, it was at first considered as a factor dealing with the linear growth, particularly perhaps growth of the long bones. Analysis in terms of this latter hypothesis, however, reveals several obstacles. In the first place bi-iliac width and sitting height were high in this factor yet the alae and vertebrae are not essentially long bones although the alae grow in a vertical direction to a considerable degree. In the second place, while the clavicles are long bones, this factor did not enter prominently into shoulder width. The alternative hypothesis of a linear or vertical factor was supported by the magnitude of the factor loadings for height and sitting height but repudiated by the loadings for knee width (a breadth or horizontal measurement) and weight.

Factor IV, which was present only between six months and three years, remains constant at .55 for the chest and shoulder measurements except at three years when it drops to —.10. If one uses this criterion alone, it would seem feasible to call it a chest and shoulder factor and might correspond to the element producing what Kretschmer (6) calls his athletic type. However, the fact that it enters into other variables at certain ages presents an enigmatic situation. It also reaches large proportions at one or more ages in limb girths, weight, hip width, knee width, elbow width, and skin and subcutaneous tissue measurements.

In conclusion it may be said that one factor has been tentatively identified and suggestions concerning three other factors have been made, but identification seems presumptuous in view of the results and the present information on the subject. Just what the obtained factors represent is hard to determine, for at the present time there are pitfalls in the way of each of the suggested hypotheses.

Summary

Multiple factor analyses were made for eighteen anthropometric measurements taken on Iowa City boys at each of nine ages between birth and six years. The measurements were height; sitting height; weight, bi-deltoid and bi-iliac diameters; bi-condylar width of the knee and elbow; width, depth, and circumference of the chest; girths of upperarm, forearm, thigh, and calf; thickness of skin and subcutaneous tissue on arm front, arm back, chest front, and chest back. The basic data were on file at the Iowa Child Welfare Research Station, having been accumulated from anthropometric examinations made during approximately the last five years. The Thurstone center of gravity multiple factor analysis technique was employed. At ages nine days, four years, and five years three group factors were found, while at all ages between six months and four years there were four group factors. The rotated factor loadings obtained corresponded roughly to zero-order correlations.

Factor I was tentatively identified as a "fat factor." This factor is largest in the measurements of thickness of skin and subcutaneous tissue, with rotated loadings varying from .45 to .90, and next largest in limb girths, with rotated loadings ranging from .44 to .60.

Factor II tends to be largest in the girth, width, and depth measurements, but is not exclusively associated with any group of variables. In one or another of the age groups studied it yielded rotated loadings of .60 or above for each variable except those for thickness of skin and subcutaneous tissue.

Factor III has loadings of .60 or above at all ages for height and sitting height and of .40 or above for widths of knee and hips during the age period from one and one-half years through five years.

Factor IV has loadings ranging from .50 to .58 from six months through two and one-half years for the chest dimensions and shoulder width. It also has loadings .50 to .61 for limb girths at nine days and for measurements of skin and subcutaneous tissue at nine days and three years.

Major conclusions of the study are: (1) the series of anthropometric measurements investigated is analyzable into four group factors and a number of specific factors; (2) one of the group factors is reasonably identified as relating to growth in subcutaneous fatty tissue; and (3) identity of the three remaining factors must await additional insight as to the primary biological differentials of growth. These conclusions are grounded on the assumptions that the multiple factor technique employed here is valid for application to anthropometric data.

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Appendix A

Tables 1 to 9 give the rotated factor loadings, the hypotenuses, and the unrotated factor loadings for each age group studied.

Table I

Boys, Age Nine Days

Variable Name	Number	Rotated Factor Loadings I	II	III	Hypotenuse*	Unrotated Factor Loadings I	II	III
Shoulder width	1	.6094	.5466	.0688	.8217	.7965	.0488	.1959
Height	2	.5300	.3988	.6481	.9275	.7626	.4758	—.2286
Sitting height	3	.5700	.4468	.5239	.8939	.7973	.3821	—.1319
Chest width**								
Chest depth**								
Hip width	6	.7191	.5689	.0997	.9226	.9073	.0383	.1626
Elbow width	7	.5381	.6547	.0661	.8501	.7854	.1242	.3006
Knee width	8	.4788	.7034	.2142	.8775	.7839	.2880	.2694
Chest circumference	9	.7070	.5866	.2250	.9460	.9278	.1507	.1071
Upperarm	10	.8158	.5134	—.0247	.9645	.9422	—.1251	.1640
Forearm	11	.8216	.5381	—.0247	.9828	.9589	—.1165	.1811
Thigh	12	.7719	.5007	.0260	.9207	.9074	—.0725	.1379
Calf	13	.8173	.5301	.0000	.9744	.9558	—.0986	.1620
Arm front	14	.8626	.0105	.0766	.8664	.7634	—.2886	—.2907
Arm back	15	.9116	.0000	.1390	.9224	.8120	—.2637	—.3493
Chest front	16	.8495	.2470	.0000	.8849	.8499	—.2384	—.0628
Chest back	17	.9039	.1089	—.0262	.9111	.8270	—.3432	—.1685
Weight	18	.7237	.6106	.2822	.9882	.9638	.2001	.0873

*Hypotenuse must be the same for both rotated and unrotated factor loadings.
**Chest width and chest depth not available for this group.

Table II

Boys, Age Six Months

Variable Name	Number	Rotated Factor Loadings I	II	III	IV	Hypotenuse*	Unrotated Factor Loadings I	II	III	IV
Shoulder width	1	—.0455	.6834	.2880	.5289	.9122	.8418	.2710	.1599	.1564
Height	2	.0000	.5471	.7596	—.0557	.9327	.5000	.7304	—.1334	—.2606
Sitting height	3	.0000	.5242	.7625	.1362	.9353	.6198	.6620	—.1847	—.1365
Chest width	4	—.2446	.5468	.2297	.6766	.9324	.7763	.2392	.1407	.4356
Chest depth	5	.3656	.5256	.1369	.2445	.6989	.6425	—.0071	.0851	.2617
Hip width	6	.2824	.5773	.0976	.5355	.8422	.8316	—.0737	.1091	—.0271
Elbow width	7	.2667	.6451	.0824	.3751	.7968	.7592	.0016	.2025	—.1330
Knee width	8	.3120	.7093	.1053	.4000	.9027	.8551	.0164	.2293	—.1771
Chest circumference	9	—.0303	.4978	.3272	.6860	.9091	.8439	.1749	—.0253	.2885
Upperarm	10	.2064	.5202	.0000	.6719	.8745	.8367	—.1678	.1006	—.1397
Forearm	11	.0842	.6018	.0252	.6697	.9045	.8550	—.0576	.2071	—.2023
Thigh	12	.2853	.5028	.0388	.6411	.8641	.8400	—.1774	.0752	.0633
Calf	13	.3787	.6443	.1207	.4601	.8866	.8612	—.0567	.1198	—.1649
Arm front	14	.4776	.2154	.0000	.5085	.7515	.6408	—.3663	—.1265	—.0613
Arm back	15	.4287	.3663	.0000	.5175	.7654	.7068	—.2832	—.0078	—.0784
Chest front	16	.5620	.0000	.2602	.6963	.9319	.7039	—.3541	—.4978	.0037
Chest back	17	.3055	.1630	.0369	.6538	.7407	.6402	—.3063	—.1546	.1452
Weight	18	.1919	.6671	.4918	.4499	.9625	.9064	.3101	—.0427	—.0836

*Hypotenuse must be the same for both rotated and unrotated factor loadings.

TABLE III

BOYS, AGE ONE YEAR

Variable Name	Number	Rotated Factor Loadings I	II	III	IV	Hypotenuse*	Unrotated Factor Loadings I	II	III	IV
Shoulder width	1	.1242	.4978	.3770	.1410	.7744	.6950	.3026	—.0114	.1580
Height	2	—.0299	.5608	.7393	.0000	.9283	.5039	.7605	.0566	—.0566
Sitting height	3	.0227	.6164	.6390	.0000	.8881	.5349	.6843	—.0371	—.1815
Chest width	4	.0209	.2870	.5450	.5559	.8300	.6343	.3656	.2507	.3000
Chest depth	5	.2309	.2535	.1266	.5723	.6801	.6228	—.0502	.0507	.2610
Hip width	6	.5300	.4496	.4043	.2872	.8532	.8163	.1121	.0885	—.2035
Elbow width	7	.2963	.5762	.0464	.3225	.7252	.6728	.0352	—.2681	.0124
Knee width	8	.3699	.6282	.2907	.1861	.8066	.7370	.2159	—.1637	—.1845
Chest circumference	9	.1671	.3378	.4103	.7698	.9502	.8231	.1659	.1984	.3981
Upperarm	10	.3881	.5919	—.1834	.5157	.8946	.7734	—.2106	—.3695	.1461
Forearm	11	.4046	.6693	—.1616	.4793	.9313	.8111	—.1651	—.4157	.0970
Thigh	12	.5471	.5547	.0000	.4131	.8819	.8375	—.1629	—.2166	—.0563
Calf	13	.3731	.6278	.1328	.3032	.8017	.7579	.0784	—.2398	—.0681
Arm front	14	.6617	—.1739	.0000	.3853	.7850	.4858	—.5169	.3274	—.0770
Arm back	15	.6140	—.0624	—.0367	.4113	.7424	.5927	—.4256	.1291	—.0445
Chest front	16	.7551	—.0219	.1310	.3861	.8583	.6593	—.4151	.3182	—.1689
Chest back	17	.7669	.0000	.0000	.3297	.8346	.6088	—.4917	.2106	—.1996
Weight	18	.3455	.6830	.4177	.3595	.9431	.8862	.3026	—.0936	—.0619

*Hypotenuse must be the same for both rotated and unrotated factor loadings

TABLE IV ✓

BOYS, AGE ONE YEAR, SIX MONTHS

Variable Name	Number	Rotated Factor Loadings I	II	III	IV	Hypotenuse*	Unrotated Factor Loadings I	II	III	IV
Shoulder width	1	.1540	.6246	.2918	.2777	.7594	.7221	.2023	—.0146	—.1189
Height	2	.0000	.4627	.7540	.0544	.8861	.5829	.6190	—.1435	.2041
Sitting height	3	.0000	.5091	.6984	.0414	.8654	.5926	.5909	—.1674	.1413
Chest width	4	—.0530	.4620	.2305	.6306	.8167	.6383	.2341	.4186	—.1724
Chest depth	5	.0709	.4004	—.0989	.5234	.6700	.5112	—.0900	.3224	—.2782
Hip width	6	.3390	.5247	.5128	.2249	.8389	.7862	.2176	—.0924	.1722
Elbow width	7	.2339	.6174	.0966	.3354	.7468	.7181	.0060	.0284	—.2032
Knee width	8	.2613	.5833	.4169	.0182	.7633	.6725	.2344	—.2708	.0444
Chest circumference	9	.1023	.5646	.2038	.6093	.8612	.7672	.1330	.3236	—.1755
Upperarm	10	.4834	.7857	.0000	.1302	.9319	.8389	—.1766	—.2764	—.2386
Forearm	11	.3607	.8488	.0000	.1563	.9354	.8353	—.0831	—.2393	—.3363
Thigh	12	.5289	.6964	.0842	.1230	.8871	.8210	—.1662	—.2707	—.1092
Calf	13	.4379	.7347	.1314	.1228	.8740	.8189	—.0636	—.2606	—.1460
Arm front	14	.6163	—.0684	—.0681	.3395	.7102	.3704	—.5100	.1593	.2859
Arm back	15	.7583	.1294	.0000	.2246	.8014	.5498	—.5070	—.0528	.2837
Chest front	16	.5154	—.0534	—.0190	.5936	.7882	.4560	—.4282	.4097	.2522
Chest back	17	.6171	.0000	.0620	.2917	.6854	.4390	—.4008	.0865	.3301
Weight	18	.3504	.6392	.5093	.2352	.9198	.8753	.2302	—.1237	.1070

*Hypotenuse must be the same for both rotated and unrotated factor loadings

TABLE V

BOYS, AGE TWO YEARS

Variable Name	Number	Rotated Factor Loadings I	II	III	IV	Hypotenuse*	Unrotated Factor Loadings I	II	III	IV
Shoulder width	1	.4138	.2128	.6151	.2681	.8165	.7702	.1921	.1002	—.1121
Height	2	—.0809	.0000	.8946	—.1887	.9179	.5695	.6678	—.1166	.2423
Sitting height	3	.1795	.0000	.8047	—.1522	.8384	.5939	.5327	—.0997	.2477
Chest width	4	.3829	—.1560	.5519	.5698	.8940	.6917	.1272	.5528	.0117
Chest depth	5	.3845	.0605	.0534	.5770	.6981	.4393	—.2624	.4132	—.2341
Hip width	6	.4555	.2089	.5846	.1277	.7806	.7634	.1589	—.0192	—.0298
Elbow width	7	.3234	.2085	.4924	.3087	.6971	.6449	.1479	.1379	—.1708
Knee width	8	.3134	.3624	.6771	.0914	.8345	.7438	.3227	—.1164	—.1597
Chest circumference	9	.5759	.0907	.3059	.6185	.9034	.7489	—.1890	.4270	—.1932
Upperarm	10	.6529	.5841	.2933	.0256	.9243	.7966	—.1779	—.3432	—.2653
Forearm	11	.6371	.5228	.4065	.0000	.9190	.8351	—.0771	—.3233	—.1916
Thigh	12	.5379	.4980	.4546	.0479	.8641	.7954	.0161	—.2587	—.2165
Calf	13	.6534	.3332	.4882	—.0970	.8865	.8350	—.0125	—.2962	.0261
Arm front	14	.7135	—.3057	—.0628	.0000	.7788	.4152	—.4894	.1020	.4292
Arm back	15	.7183	.0786	.0423	.0076	.7239	.5723	—.4115	—.0984	.1326
Chest front	16	.7168	—.1747	.0000	.0795	.7424	.5010	—.4518	.0992	.2935
Chest back	17	.6836	.0082	.0896	.0000	.6895	.5581	—.3523	—.0605	.1901
Weight	18	.4784	.3182	.7534	.0030	.9476	.8844	.2904	—.1758	—.0239

*Hypotenuse must be the same for both rotated and unrotated factor loadings

TABLE VI

BOYS, AGE TWO YEARS, SIX MONTHS

Variable Name	Number	Rotated Factor Loadings I	II	III	IV	Hypotenuse*	Unrotated Factor Loadings I	II	III	IV
Shoulder width	1	.1664	.4303	.3775	.5664	.8222	.7035	.3225	.2459	—.1298
Height	2	.0000	.3735	.8181	.1382	.9098	.5654	.6477	—.0893	.2840
Sitting height	3	.0000	.2428	.7601	.2832	.8470	.5178	.6082	.1034	.2612
Chest width	4	.2631	.1803	.2519	.7214	.8280	.6211	.1486	.5175	—.0993
Chest depth	5	.5593	—.1148	.0424	.4900	.7535	.4619	—.2958	.5021	.1226
Hip width	6	.3353	.4649	.5734	.1243	.8202	.7342	.2673	—.1329	.2110
Elbow width	7	.2248	.5252	.1210	.3535	.6826	.6302	.0911	.0192	—.2452
Knee width	8	.1855	.7777	.3667	.1186	.8875	.7617	.2927	—.3173	—.1464
Chest circumference	9	.6272	.0551	.0706	.5789	.8582	.6497	—.2746	.4869	.0437
Upperarm	10	.5734	.6511	—.0475	.1953	.8906	.8026	—.2661	—.1629	—.2275
Forearm	11	.4591	.7157	.0000	.2334	.8818	.8033	—.1360	—.1728	—.2897
Thigh	12	.4443	.6875	.1493	.3078	.8871	.8563	—.0175	—.0960	—.2106
Calf	13	.3538	.7451	.1387	.2133	.8631	.7987	.0328	—.2114	—.2479
Arm front	14	.6684	.1227	.0000	—.1361	.6930	.4311	.4618	—.1446	.2455
Arm back	15	.7213	.2668	.0000	—.0817	.7734	.5715	—.4605	—.1754	.1691
Chest front	16	.6194	.2598	—.0196	.0000	.6719	.5286	—.3903	—.1083	.0896
Chest back	17	.6427	.3968	—.0214	—.0223	.7690	.6245	—.3814	—.1869	.0267
Weight	18	.3182	.6627	.5154	—.2212	.9247	.8605	.2959	—.1615	.0249

*Hypotenuse must be the same for both rotated and unrotated factor loadings

TABLE VII

BOYS, AGE THREE YEARS

Variable Name	Number	Rotated Factor Loadings I	II	III	IV	Hypotenuse*	Unrotated Factor Loadings I	II	III	IV
Shoulder width	1	—.0856	.7126	.2058	—.1307	.7580	.6610	.3325	.1574	—.0560
Height	2	.0000	.4123	.7595	—.3023	.9155	.6001	.5054	—.3701	.2930
Sitting height	3	.0000	.4859	.6410	—.1769	.8235	.6279	.4225	—.2892	.1481
Chest width	4	.2324	.7660	.0823	—.1686	.8224	.6163	.4230	.3211	—.1203
Chest depth	5	.0823	.6170	—.1996	—.0935	.6603	.4507	.1282	.4457	—.1338
Hip width	6	.0708	.5385	.5250	.0126	.7555	.5636	.2559	—.2546	—.0159
Elbow width	7	.2783	.2412	.2291	—.0694	.4392	.3834	—.0596	—.1274	.1619
Knee width	8	.3152	.5644	.4483	—.0847	.7912	.7496	.0666	—.1909	.1530
Chest circumference	9	—.1496	.7685	.0394	—.0626	.7864	.6350	.2990	.3041	—.1834
Upperarm	10	.5748	.6673	—.0800	—.2883	.9302	.7670	—.2715	.3139	.3236
Forearm	11	.6013	.6375	.0000	—.3025	.9271	.7753	—.2594	.2364	.3678
Thigh	12	.4399	.6124	.2271	—.0644	.7901	.7672	—.1262	—.0189	.1398
Calf	13	—.0112	.7299	.2096	.3103	.8204	.7045	.1137	—.0129	—.4047
Arm front	14	.4966	.0000	.0000	.5008	.7053	.1787	—.5869	—.2732	—.2152
Arm back	15	.5619	.2632	.1457	.4516	.7812	.3879	—.6353	—.0477	—.2317
Chest front	16	.3602	.3603	.0542	.5425	.7469	.4640	—.4048	—.1744	—.3851
Chest back	17	.3275	.3422	.0000	.5118	.6974	.4193	—.3926	—.1183	—.3772
Weight	18	.1606	.7135	.6369	—.1190	.9765	.8841	.3100	—.2509	.1134

*Hypotenuse must be the same for both rotated and unrotated factor loadings

TABLE VIII

BOYS, AGE FOUR YEARS

Variable Name	Number	Rotated Factor Loadings I	II	III	Hypotenuse*	Unrotated Factor Loadings I	II	III
Shoulder width	1	.1777	.6358	.2781	.7160	.6617	.2361	.1378
Height	2	.0302	.2191	.8843	.9114	.5465	.4548	—.5703
Sitting height	3	.0404	.2664	.8266	.8694	.5605	.4401	—.4979
Chest width	4	.2347	.5619	.3856	.7206	.6897	.2083	.0011
Chest depth	5	.0393	.6504	—.0492	.6531	.4515	.2084	.4233
Hip width	6	.1976	.2824	.6293	.7175	.5790	.2333	—.3537
Elbow width	7	.1404	.6106	.2293	.6669	.6018	.2343	.1662
Knee width	8	.3341	.4052	.4516	.6926	.6676	.0947	—.1582
Chest circumference	9	.3353	.7137	.1574	.8039	.7560	.0877	.2587
Upperarm	10	.5013	.6763	—.0408	.8426	.7422	—.1480	.3703
Forearm	11	.4066	.7661	.0711	.8698	.7968	.0135	.3486
Thigh	12	.4652	.7148	.2237	.8814	.8607	.0134	.1895
Calf	13	.2695	.7222	.1766	.7905	.7317	.1524	.2574
Arm front	14	.7751	—.2161	.0795	.8088	.3362	—.6733	—.2962
Arm back	15	.7621	.0774	—.1561	.7820	.4311	—.6490	.0674
Chest front	16	.7693	.0000	.0892	.7747	.4864	—.5775	—.1735
Chest back	17	.7660	.2268	.0000	.7991	.6032	—.5230	.0332
Weight	18	.2750	.5210	.6220	.8564	.7858	.2639	—.2153

*Hypotenuse must be the same for both rotated and unrotated factor loadings.

TABLE IX

BOYS, AGE FIVE YEARS

Variable Name	Number	Rotated Factor Loadings I	II	III	Hypotenuse*	Unrotated Factor Loadings I	II	III
Shoulders	1	.1355	.5866	.3168	.6801	.6471	—.2083	—.0228
Height	2	.0010	.5285	.7518	.9188	.6737	—.4971	—.3785
Sitting height	3	.0374	.4919	.7886	.9302	.6724	—.4717	—.4366
Chest width	4	.0000	.7376	.1891	.7613	.6673	—.3120	.1923
Chest depth	5	—.0688	.6731	—.0344	.6773	.5110	—.2503	.3674
Hip width	6	.1811	.5487	.6036	.8355	.7281	—.2861	—.2933
Elbow	7	.3102	.6128	.3169	.7563	.7509	—.0690	—.0574
Knee	8	.1985	.6960	.4906	.8742	.8219	—.2665	—.1332
Chest circumference	9	.0079	.8874	.1783	.9051	.7910	—.3468	.2706
Upperarm	10	.5123	.7686	—.1689	.9389	.8205	.2685	.3692
Forearm	11	.3824	.8168	.0000	.9017	.8524	.0691	.2857
Thigh	12	.4962	.7613	.1089	.9150	.8947	.1334	.1374
Calf	13	.1691	.8363	.1096	.8601	.8029	—.1650	.2605
Arm front	14	.7933	—.0059	—.0056	.7933	.3666	.6710	—.2115
Arm back	15	.6786	.1461	—.2170	.7273	.3708	.6219	.0687
Chest front	16	.8328	.0074	.0398	.8338	.4105	.6799	—.2539
Chest back	17	.8170	.1044	.0000	.8238	.4704	.6545	—.1701
Weight	18	.2655	.8287	.4133	.9632	.9382	—.2168	—.0235

*Hypotenuse must be the same for both rotated and unrotated factor loadings.

Appendix B

In Tables 10 and 11, factor loadings obtained by computing three separate sets of analyses for each age group in which four factors were present. One set omitted those variables which were apparently correlated with Factor I, one set omitted those variables which were apparently correlated with Factor III, and the other set omitted those variables which were apparently correlated with Factor IV. These loadings were not used in the results but are included here since the procedure was referred to on page 216.

Table X

Six Months Through One Year, Six Months

Variable Name	Number	Age, Six Months I	II	III	IV	Age, One Year I	II	III	IV	Age, One Year, Six Months I	II	III	IV
Shoulder width	1	.6119	.5514	.2598	.2845	.2749	.6179	.1676	.3398	.2343	.6681	.1091	.2516
Height	2	.1740	.3194	.8444	.1546	.0112	.4802	.7589	.2349	—.0592	.4900	.7404	.0000
Sitting height	3	.3163	.3171	.8340	.0000	.0515	.5254	.7089	.2912	—.0434	.5213	.6867	.0000
Chest width	4	.5863	.5210	.4941	.1008	.2350	.4808	.2232	.5939	.1533	.4383	.0000	.6868
Chest depth	5	.6107	.1592	.2961	.0485	.4453	.3996	.0000	.3467	.2644	.3419	.2615	.4422
Hip width	6	.7873	.1973	.0000	.2546	.6076	.3966	.4554	.0000	.3617	.5397	.5259	.0700
Elbow width	7	.6858	.1743	.0000	.5211	.3823	.5793	.1398	.1572	.2812	.6682	.0000	.2660
Knee width	8	.7493	.2471	.0000	.5064	.3666	.6105	.3936	.0000	.2059	.6048	.3787	.1755
Chest circumference	9	—.0300	.4998	.3220	.6865	.4233	.6354	.1393	.5483	.3044	.4848	.0000	.6525
Upperarm	10	.7105	.5717	.0000	.0000	.6233	.6341	—.1752	—.1872	.4618	.7847	.0000	.0000
Forearm	11	.6075	.6131	.1000	.1998	.5998	.7028	—.1298	—.1784	.3870	.8501	.0335	.0437
Thigh	12	.7483	.4385	—.0112	—.0048	.6489	.5933	.0000	.0000	.5160	.6985	.1096	.0230
Calf	13	.7085	.4558	.1051	.2863	.4555	.6236	.1771	.0088	.4244	.7721	.1591	.0631
Arm front	14	.7545	—.0120	.0000	.0000	.7450	—.1245	—.0357	.1840	.6993	.0063	—.0002	.1253
Arm back	15	.7580	.1308	—.0080	—.0028	.7308	.0744	—.0223	.0809	.7916	.1423	.0000	.0000
Chest front	16	.8398	.0000	.0315	—.2360	.8480	—.0215	.1205	.1869	.6862	—.0641	.1386	.3752
Chest back	17	.7715	.1034	—.2207	—.2582	.8215	.0000	—.0013	.0000	.6987	.0000	.0903	.1104
Weight	18	.1900	.6606	.4928	.4501	.4767	.6781	.4237	.1513	.3334	.6629	.5656	.0000

Table XI

Two Years Through Three Years

Variable Name	Number	Age, Two Years I	II	III	IV	Age, Two Years, Six Months I	II	III	IV	Age, Three Years I	II	III	IV
Shoulder width	1	.2216	.6873	.0000	.2351	.2464	.6219	.2114	.4290	.2059	.5153	.2137	.4701
Height	2	—.0215	.5280	.7347	.1513	.0546	.3760	.8245	.0591	.0668	.5885	.6863	.1284
Sitting height	3	.0507	.5230	.6779	.0000	—.0023	.3642	.7426	.1780	.1869	.5051	.6430	.0000
Chest width	4	.2462	.3541	.2264	.7545	.2283	.4220	.2398	.6308	.0911	.5041	.1876	.5161
Chest depth	5	.3334	.1430	.2791	.5272	.3699	.0410	.2195	.6175	.1460	.4347	.0000	.4772
Hip width	6	.4207	.3353	.4068	.0000	.4662	.3600	.6250	.0000	.2623	.5655	.4000	.1493
Elbow width	7	.1665	.5273	.0721	.4184	.3796	.4524	.2334	.2504	.2541	.2587	—.0058	.2458
Knee width	8	.2077	.7470	.2560	.1720	.3297	.6985	.4153	.1371	.3338	.7106	.1907	.0000
Chest circumference	9	.4123	.3757	.0724	.7069	.4812	.1865	.0000	.7334	.2609	.4594	.0000	.6313
Upperarm	10	.4475	.7836	—.0909	.0000	.6614	.5954	—.0433	.0387	.3976	.7818	—.2935	—.0078
Forearm	11	.3900	.8326	.0000	.1794	.5867	.6781	.0000	.0000	.4321	.7624	—.2356	—.1282
Thigh	12	.3400	.7998	.0485	.0720	.5813	.6455	.1849	.1251	.4183	.6764	.0000	.0000
Calf	13	.4230	.7620	.1372	.0829	.5074	.7105	.1374	.0196	.2688	.7621	—.0640	—.1168
Arm front	14	.7058	—.0185	.0000	.1484	.7028	—.0977	.0000	.0000	.6038	—.1370	—.1610	—.2389
Arm back	15	.6916	.2759	—.1237	.0229	.7789	.0484	—.0072	.0000	.6964	.0881	—.3382	—.1975
Chest front	16	.7532	.0407	.0742	.1643	.7038	.0000	—.0434	.1204	.7596	—.0250	—.1161	.0797
Chest back	17	.6951	.1838	.1044	.0000	.7717	.0980	.0691	.0470	.6968	.0000	.0000	.0000
Weight	18	.3440	.7428	.4873	.0000	.4337	.6540	.5367	.1958	.3500	.7301	.5349	.1095